STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

VIA ELECTRONIC MAIL

October 5, 2018

Jeffrey Barbadora
Crown Castle
Real Estate Specialist
12 Gill Street, Suite 5800
Woburn, MA 01801

RE: **EM-SPRINT-029-180914** – Sprint notice of intent to modify an existing telecommunications facility located at 161 Pinney Street, Colebrook, Connecticut.

Dear Mr. Barbadora:

The Connecticut Siting Council (Council) is in receipt of your correspondence of October 5, 2018 submitted in response to the Council's September 18, 2018 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

The submission renders the request for exempt modification complete and the Council will process the request in accordance with the Federal Communications Commission 60-day timeframe.

Thank you for your attention and cooperation.

Sincerely,

Melanie A. Bachman
Executive Director

MAB/FC/emr

Robidoux, Evan

From: Barbadora, Jeff <Jeff.Barbadora@crowncastle.com>
Sent: Friday, October 05, 2018 11:01 AM
To: Robidoux, Evan
Cc: CSC-DL Siting Council
Subject: RE: Council Incomplete Letter for EM-SPRINT-029-180914-PinneySt-Colebrook
Attachments: Opinion-Letter-10-01-18.pdf; Mount-Analysis.pdf

Good morning,

Crown has reviewed the incomplete letter and have attached the structural analysis that states the final stress capacity of the tower. Also attached is the mount analysis, which does state a reinforcement kit is required.

Please let me know if Crown needs to send hard copies of the attachments or if there are additional questions.

Thanks,

Jeffrey Barbadora
781-970-0053
12 Gill Street, Suite 5800, Woburn, MA 01801
CrownCastle.com

From: Robidoux, Evan
Sent: Friday, September 28, 2018 9:11 AM
To: Barbadora, Jeff
Cc: CSC-DL Siting Council
Subject: Council Incomplete Letter for EM-SPRINT-029-180914-PinneySt-Colebrook

Please see the attached correspondence.

Evan Robidoux
Clerk Typist
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

September 28, 2018

Mitzi Dunst
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277
(704) 405-6580

B+T Group
1717 S. Boulder, Suite 300
Tulsa, OK 74119
(918) 587-4630
btwo@btgrp.com

Subject:	**Structural Opinion Letter**	
Carrier Designation:	***Sprint PCS* Co-Locate**	
	Carrier Site Number:	CT33XC115
	Carrier Site Name:	CT33XC115
Crown Castle Designation:	**Crown Castle BU Number:**	876377
	Crown Castle Site Name:	Horton 2 / Fredsall Property
	Crown Castle JDE Job Number:	497021
	Crown Castle Work Order Number:	1574343
	Crown Castle Order Number:	434691 Rev. 6
Engineering Firm Designation:	**B+T Group Project Number:**	112179.004.01a
Site Data:	**161 Pinney Street, Colebrook, Litchfield County, CT** **Latitude *41° 57' 58.9"*, Longitude *-73° 7' 18.1"*** **148 Foot - Monopole Tower**	

Dear Mitzi Dunst,

B+T Group is pleased to submit this **"Structural Opinion Letter"** to determine the structural integrity of the above mentioned tower. This evaluation has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 1193987, in accordance with application 434691, revision 6.

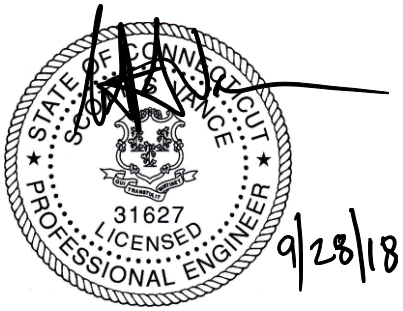
The purpose of the opinion letter is to determine the suitability of the tower with the proposed and existing loading as specified in Tables 1 & 2. This opinion is consistent with the guidelines as stated in the TIA/EIA-222-G standard and 2016 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 115 mph converted to a nominal 3-second gust wind speed of 89 mph.

Based on a comparison of the previous analysis loads (Crown Castle Work Order Number: 1550320/B+T Group Structural Analysis dated April 2, 2018) with the loads listed in Tables 1 & 2, we have determined the tower structure and foundation ***ARE*** sufficient.

We at the *B+T Group* appreciate the opportunity of providing our continuing professional services to you. If you have any questions or need further assistance on this or any other projects, please give us a call.

Structural Letter prepared by: Brandon Sevier, P.E.

Respectfully submitted by: B+T Engineering, Inc.
COA: PEC.0001564 Expires: 02/10/2019



Scott S. Vance, P.E.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
150.0	150.0	1	Site Pro	PRK-I245	1	1-5/8	--
	148.0	3	--	2.5" Std. (2.88" O.D.) Pipe			
		3	Alcatel Lucent	800MHZ RRH			
		3	Alcatel Lucent	TD-RRH8X20-25			
		3	Commscope	NNVV-65B-R4			
		3	Rfs Celwave	APXVTM14-ALU-I20			

Table 2 - Existing Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
150.0	150.0	1	--	Miscellaneous [NA 510-1]	2	1-1/4	1
		1	--	Platform Mount [LP 1201-1]			
	148.0	3	Alcatel Lucent	PCS 1900MHz 4x45W-65MHz			
		3	Alcatel Lucent	800 EXTERNAL NOTCH FILTER			
		3	Alcatel Lucent	800MHZ RRH			
		9	**Rfs Celwave**	**ACU-A20-N**	**1**	**1-1/4**	**2**
		3	**Rfs Celwave**	**APXVSPP18-C-A20**			
141.0	143.0	3	Ericsson	RRUS 11 B12	--	--	1
	141.0	1	--	Side Arm Mount [SO 102-3]			
140.0	142.0	6	Powerwave Tech.	7770.00	12 2 1	1-5/8 7/16 3/8	1
		6	Powerwave Tech.	LGP 17201			
	140.0	3	Kmw Comm.	AM-X-CD-16-65-00T-RET			
		1	Raycap	DC6-48-60-18-8F			
		1	--	T-Arm Mount [TA 602-3]			
130.0	130.0	3	Alcatel Lucent	RRH2X60-AWS	13	1-5/8	1
		3	Alcatel Lucent	RRH2x60-700			
		2	Antel	LPA-80080-6CF-EDIN-6			
		4	Antel	LPA-80080/6CF			
		6	Commscope	SBNHH-1D65B			
		1	--	Platform Mount [LP 303-1]			

Notes:
1) Existing Equipment
2) Equipment To Be Removed; Not Considered in This Analysis

Table 3 - Previous Analysis Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
150.0	150.0	1	Site Pro	PRK-I245	--	--	2
		1	--	Miscellaneous [NA 510-1]	2	1-1/4	1
		1	--	Platform Mount [LP 1201-1]			
	148.0	3	Alcatel Lucent	PCS 1900MHz 4x45W-65MHz			
		3	--	2.5" Std. (2.88" O.D.) Pipe	1 1	1-1/4 7/8	2
		6	Alcatel Lucent	RRH2X50-800			
		3	Alcatel Lucent	TD-RRH8X20-25			
		3	Commscope	NNVV-65B-R4			
		3	Rfs Celwave	APXVTM14-ALU-I20			
141.0	143.0	3	Ericsson	RRUS 11 B12	--	--	1
	141.0	1	--	Side Arm Mount [SO 102-3]			
140.0	142.0	6	Powerwave Tech.	7770.00	12 2 1	1-5/8 7/16 3/8	1
		6	Powerwave Tech.	LGP 17201			
	140.0	3	Kmw Comm.	AM-X-CD-16-65-00T-RET			
		1	Raycap	DC6-48-60-18-8F			
		1	--	T-Arm Mount [TA 602-3]			
130.0	130.0	3	Alcatel Lucent	RRH2X60-AWS	13	1-5/8	1
		3	Alcatel Lucent	RRH2x60-700			
		2	Antel	LPA-80080-6CF-EDIN-6			
		4	Antel	LPA-80080/6CF			
		6	Commscope	SBNHH-1D65B			
		1	--	Platform Mount [LP 303-1]			

Notes:
1) Existing Equipment
2) Proposed Equipment

Table 4 – Overall Stress Rating Comparison

Analysis	Capacity	Pass / Fail
Previous Analysis	74.5	Pass
Current Analysis	75.2	Pass

Date: **July 17, 2018**

Jeffrey Barbadora
Crown Castle
2000 Corporate Drive
Canonsburg, PA 15317
(724) 416-2000

Hudson Design Group LLC
45 Beechwood Drive
N. Andover, MA 01845
(978) 557-5553

Subject:	**Mount Structural Analysis**	
Carrier Designation:	**Sprint Equipment Change-Out**	
	Carrier Site Number:	CT33XC115
	Carrier Site Name:	Horton 2/ Fredsall Property
Crown Castle Designation:	**Crown Castle BU Number:**	876377
	Crown Castle Site Name:	Horton 2/ Fredsall Property
	Crown Castle JDE Number:	497021
	Crown Castle PO Number:	1217723
	Crown Castle Application Number:	434691 Rev.6
Engineering Firm Designation:	**Crown Castle Report Designation:**	112179.004.01
Site Data:	**161 Pinney Street, Colebrook, CT, 06021**	
	Latitude: 41° 57' 58.90" Longitude: -73° 7' 18.10"	
Structure Information:	**Tower Height & Type:**	**148 ft Monopole**
	Mount Elevation:	**148 ft**
	Mount Width & Type:	**12 ft Platform**

Dear Jeffrey Barbadora,

Hudson Design Group LLC (HDG) is pleased to submit this "Mount Structural Analysis Report" to determine the structural integrity of Sprint's antenna mounting system with the proposed appurtenance and equipment addition on the abovementioned supporting tower structure. Analysis of the existing supporting tower structure is to be completed by others and therefore is not part of this analysis. Analysis of the antenna mounting system as a tie-off point for fall protection or rigging is not part of this document.

Based upon our analysis, we have determined the adequacy of the antenna mounting system that will support the existing and proposed loading to be:

Platform Conditional

This analysis has been performed in accordance with the 2012 International Building Code and the TIA-222-G based on a basic wind speed of 100 mph as required for use in the TIA-222-G Standard Annex B. Exposure Category B with a maximum topographic factor, K_{zt}, of 1.0 and Risk Category II were used in this analysis.

We at HDG appreciate the opportunity of providing our continuing professional services to you and Crown Castle. If you have any questions or need further assistance on this or any other projects, please give us a call.

Mount structural analysis prepared by: HDG
Respectfully Submitted by:

Michael Cabral
Structural Dept. Head

STATE OF CONNECTICUT
DANIEL HAMM
24178
LICENSED PROFESSIONAL ENGINEER

Daniel P. Hamm, P.E.
Principal

TABLE OF CONTENTS

1) INTRODUCTION

This mount is a 12' platform. No original structural design documents or fabrication drawings were available for the existing mounts. A mount mapping was not performed at this site. HDG performed a visual assessment using field photographs and mount mapping data from similar mounts to perform this analysis. The mount is installed at an elevation of 148 ft on the 148 ft Monopole.

2) ANALYSIS CRITERIA

The mount structural analysis was conducted in accordance with the requirements of TIA-222-G, Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a basic wind speed of 100 mph with no ice, 40 mph with a 2.32 inch escalated ice thickness, Exposure Category B and Topographic category 1 with a crest height of 0 ft. In addition, the mounts have been analyzed for various live loading conditions consisting of a 250 pound man live load applied individually at the midpoint and cantilevered ends of horizontal members as well as a 500 pound man live load applied individually at mount pipe locations using a 3-second gust wind speed of 30 mph.

Table 1 - Proposed Equipment Loading Information

Mount Centerline (ft)	Antenna Centerline (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Mount	Note
148	148	3	RFS/Celwave	APXVTM14-ALU-I20	-	1,2
		3	Commscope	NNVV-65B-R4	-	1,2
		3	Alcatel Lucent	800 MHz 2x50	-	1,2
		3	Alcatel Lucent	TD-RRH8x20-25	-	1,2

Notes:
1) Proposed Equipment
2) Existing Mount to Remain

Table 2 - Existing and Reserved Equipment Loading Information

Mount Centerline (ft)	Antenna Centerline (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Existing Mount Type	Note
148	148	3	Alcatel Lucent	800 MHz 2x50	12' Platform Mount	1
		3	Alcatel Lucent	1900 MHz 4x45W-65MHz	12' Platform Mount	1
		3	Alcatel Lucent	800 External Notch Filter	12' Platform Mount	1

Notes:
1) Existing Equipment

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
HDG Construction Drawings – 12/21/17	HDG	-	HDG
RFDS	Sprint	-	ON FILE

3.1) Analysis Method

RAM Elements (Version 14.0.1), a commercially available analysis software package, was used to create a three-dimensional model of the antenna mounting system and calculate member stresses for various loading cases.

3.2) Assumptions

1) The antenna mounting system was properly fabricated, installed and maintained in good condition in accordance with its original design and manufacturer's specifications.
2) The configuration of antennas, mounts, and other appurtenances are as specified in Table 1 and 2 and the referenced drawings.
3) All member connections are assumed to have been designed to meet or exceed the load carrying capacity of the connected member unless otherwise specified in this report.
4) Steel grades have been assumed as follows, unless noted otherwise:

Channel, Solid Round, Angle, Plate	ASTM A36 (GR 36)
HSS (Square, Rectangular)	ASTM A500 (GR B)
Pipe	ASTM A53 (GR 53)
Connection Bolts	ASTM A325

This analysis may be affected if any assumptions are not valid or have been made in error. Crown Castle should be notified to determine the effect on the structural integrity of the antenna mounting system.

4) ANALYSIS RESULTS

Table 4(a) - Mount Component Stresses vs. Capacity (Platform, Alpha Sector)

Notes	Component	Member No.	Centerline (ft)	% Capacity	Pass / Fail
1	Face Horizontal	1	148	51	Pass
1	Standoff Members	42	148	21	Pass
2	Mount-to-Tower Connection	-	148	38	Pass

Table 4(b) - Mount Component Stresses vs. Capacity (Platform, Beta Sector)

Notes	Component	Beam No.	Centerline (ft)	% Capacity	Pass / Fail
1	Face Horizontal	2	148	43	Pass
1	Standoff Members	43	148	15	Pass
2	Mount-to-Tower Connection	-	148	38	Pass

Table 4(c) - Mount Component Stresses vs. Capacity (Platform, Gamma Sector)

Notes	Component	Beam No.	Centerline (ft)	% Capacity	Pass / Fail
1	Face Horizontal	3	148	39	Pass
1	Standoff Members	44	148	15	Pass
2	Mount-to-Tower Connection	-	148	38	Pass

Structure Rating (max from all components) =	**90%**

Notes:
1) See additional documentation in "Appendix C – Analysis Output" for calculations supporting the % Capacity consumed.
2) See additional documentation in "Appendix D – Additional Calculations" for calculations supporting the % capacity consumed.

4.1) Recommendations

The proposed mount has sufficient capacity to support the proposed loading with the following modifications:

- **Install new platform reinforcement kit, SitePro1 P/N PRK-1245 (or approved equal).**

APPENDIX A

WIRE FRAMES AND RENDERED MODELS

Bentley Hewlett-Packard Company

Current Date: 6/21/2018 10:07 AM
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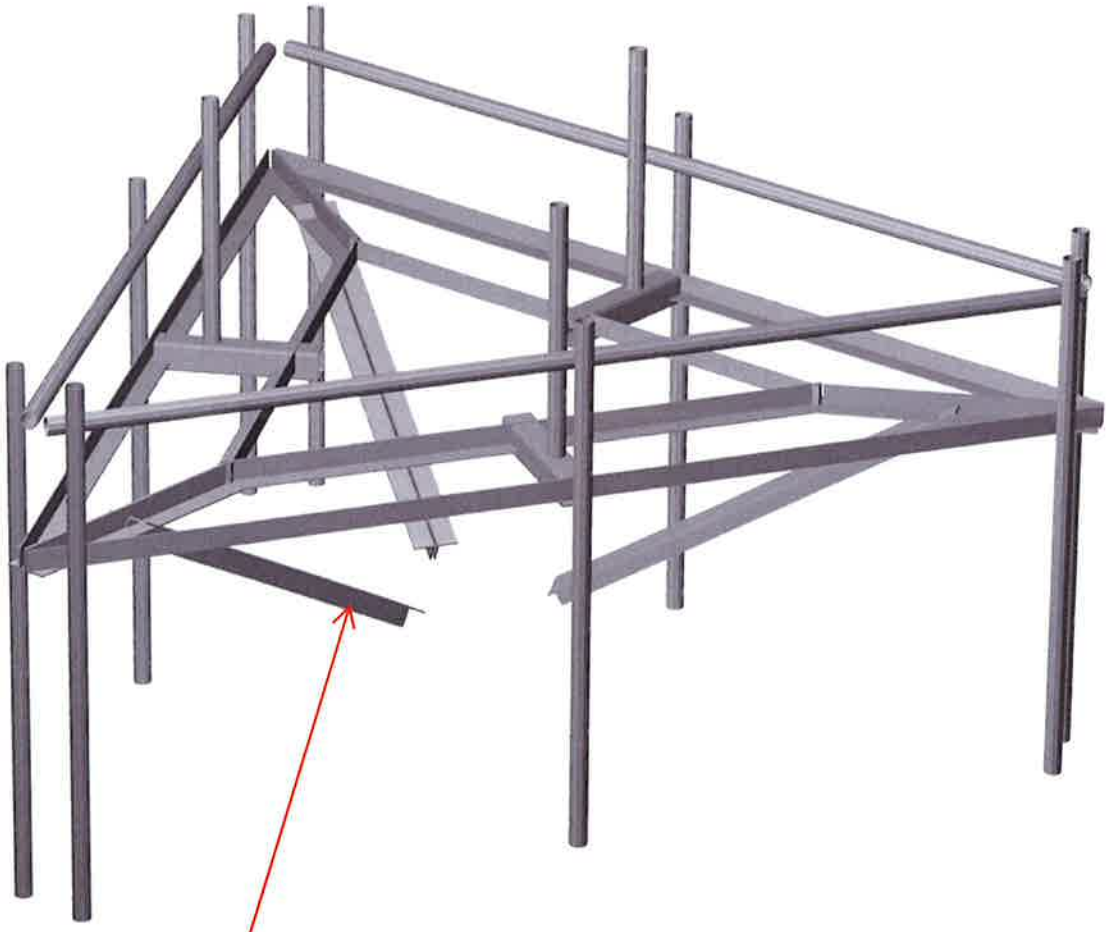
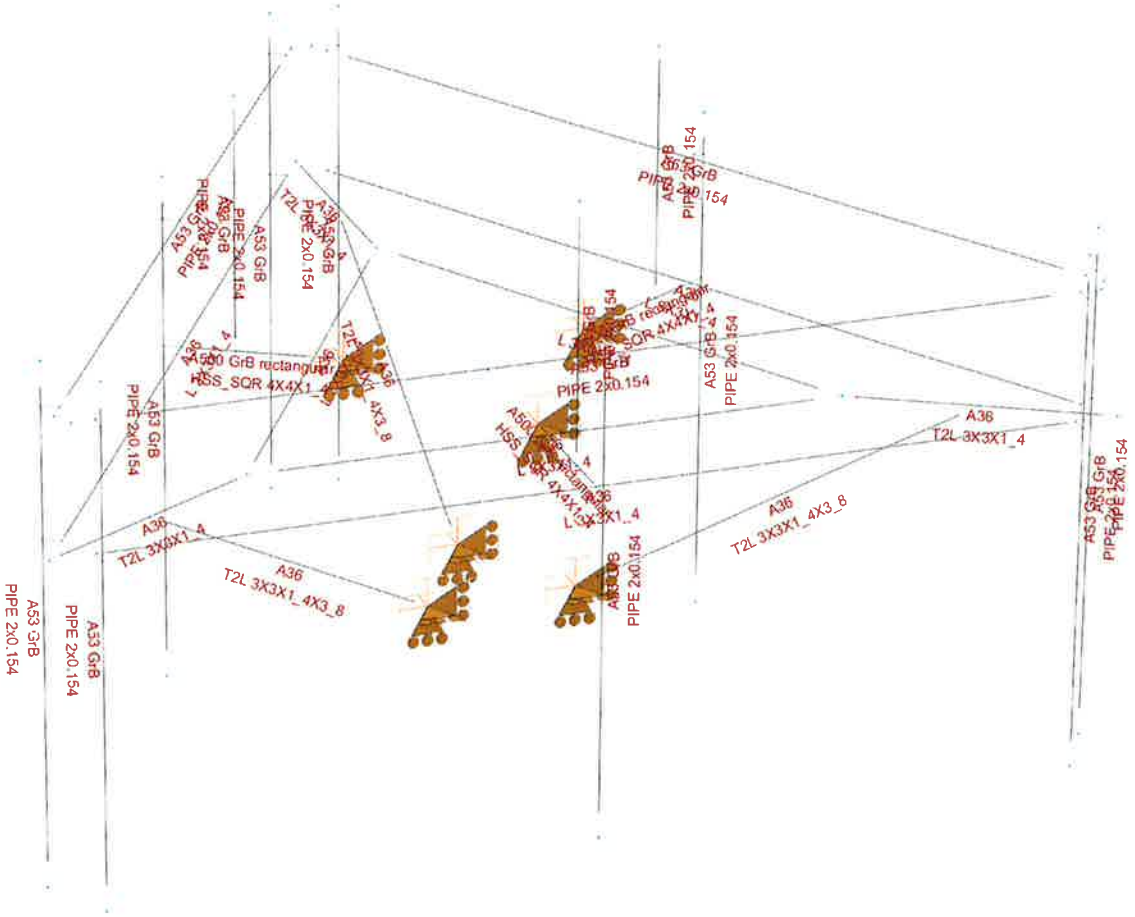


INSTALL NEW PLATFORM REINFORCEMENT KIT, SITEPRO1 P/N PRK-1245 (OR APPROVED EQUAL).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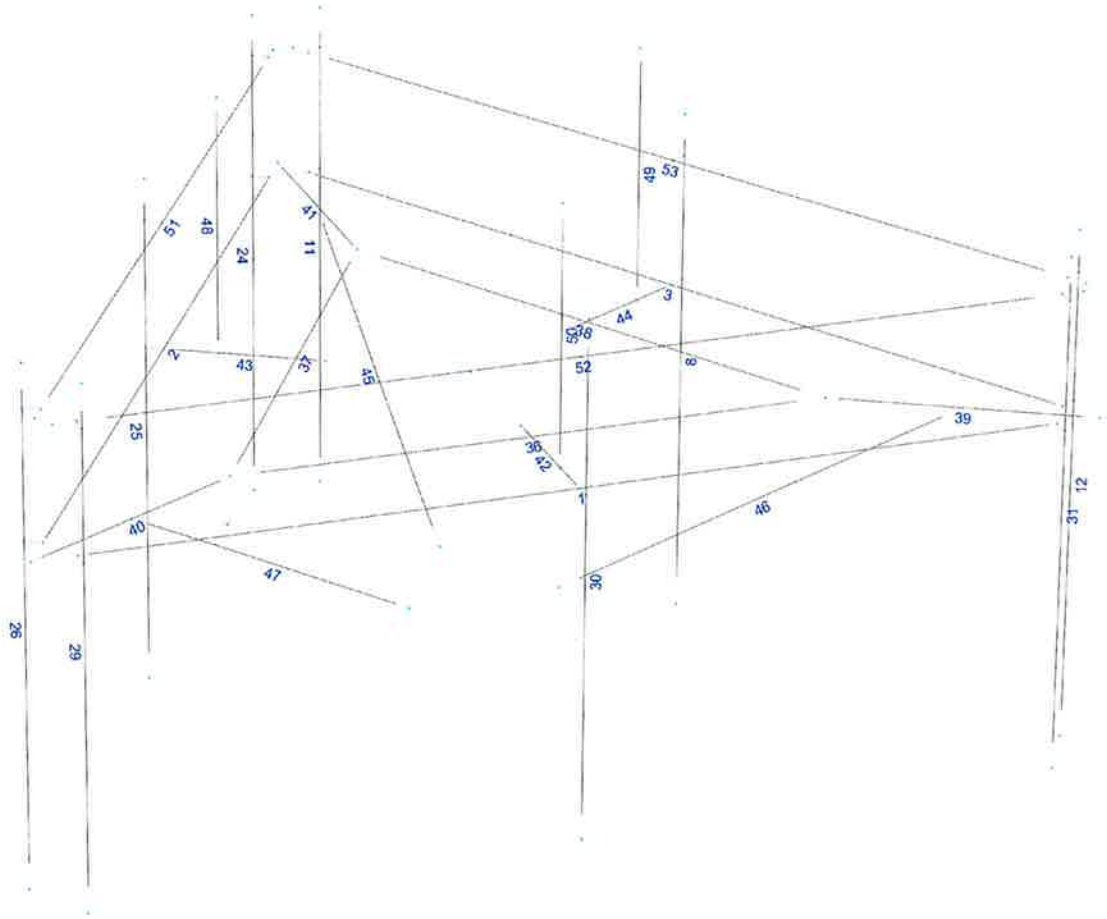
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APPENDIX B

RAM ELEMENTS INPUT CALCULATIONS

Date: 6/21/2018
Project Name: Horton 2/ Fredsall Property
Project Number: 876377
Designed By: JN **Checked By:** MSC

HUDSON Design Group LLC

2.6.5.2 Velocity Pressure Coeff:

$K_z = 2.01\ (z/z_g)^{2/\alpha}$

		z=	148 (ft)
		z_g=	1200 (ft)
K_z=	**1.105**	α=	7.0

Kzmin ≤ Kz ≤ 2.01

Table 2-4

Exposure	Z_g	α	K_{zmin}	K_e
B	1200 ft	7.0	0.70	0.9
C	900 ft	9.5	0.85	1.0
D	700 ft	11.5	1.03	1.1

2.6.6.4 Topographic Factor:

Table 2-5

Topo. Category	K_t	f
2	0.43	1.25
3	0.53	2.0
4	0.72	1.5

$K_{zt} = [1+(K_e\ K_t/K_h)]^2$

$K_h = e^{(f*z/H)}$

K_{zt}=	**#DIV/0!**	K_h=	#DIV/0!
		K_e=	0 (from Table 2-4)
(If Category 1 then K_{zt} =1.0)		K_t=	0 (from Table 2-5)
		f=	0 (from Table 2-5)
Category=	1	z=	148
		H=	0 (Ht. of the crest above surrounding terrain)
		K_{zt}=	1.00
		K_{iz} =	1.16 (from Sec. 2.6.8)

2.6.8 Design Ice Thickness

Max Ice Thickness =		t_i =	1.00 in
$t_{iz} = 2.0*t_i*I*K_{iz}*(Kzt)^{0.35}$		t_{iz} =	2.32 in

Date: 6/21/2018
Project Name: Horton 2/ Fredsall Property
Project Number: 876377
Designed By: JN Checked By: MSC

HUDSON Design Group LLC

2.6.7 Gust Effect Factor

2.6.7.1 Self Supporting Lattice Structures

Gh = 1.0 Latticed Structures > 600 ft

Gh = 0.85 Latticed Structures 450 ft or less

Gh = 0.85 + 0.15 [h/150 - 3.0] h= ht. of structure

h=	148	Gh=	0.85

2.6.7.2 Guyed Masts Gh= 0.85

2.6.7.3 Pole Structures Gh= 1.1

2.6.9 Appurtenances Gh= 1.0

2.6.7.4 Structures Supported on Other Structures
(Cantilivered tubular or latticed spines, pole, structures on buildings (ht. : width ratio > 5)

Gh=	1.35	**Gh=**	**1.00**

2.6.9.2 Design Wind Force on Appurtenances

$F = q_z * Gh * (EPA)_A$

$q_z = 0.00256 * K_z * K_{zt} * K_d * V_{max}^2 * I$

		K_z=	1.105
		K_{zt}=	1.0
q_z=	**26.88**	K_d=	0.95
$q_{z\,(Ice)}$=	**4.30**	V_{max}=	100 mph
$q_{z\,(30)}$=	**2.42**	$V_{max\,(ice)}$=	40 mph
		V_{30}=	30 mph
		I=	1.0

Table 2-2

Structure Type	Wind Direction Probability Factor, Kd
Latticed structures with triangular, square or rectangular cross sections	0.85
Tubular pole structures, latticed structures with other cross sections, appurtenances	0.95

Date: 6/21/2018
Project Name: Horton 2/ Fredsall Property
Project Number: 876377
Designed By: JN Checked By: MSC

HUDSON Design Group LLC

Determine Ca:

Table 2-8

Force Coefficients (Ca) for Appurtenances				
Member Type		Aspect Ratio ≤ 2.5	Aspect Ratio = 7	Aspect Ratio ≥ 25
		Ca	Ca	Ca
Flat		1.2	1.4	2.0
Round	C < 32 (Subcritical)	0.7	0.8	1.2
	32 ≤ C ≤ 64 (Transitional)	$3.76/(C^{0.485})$	$3.37/(C^{0.415})$	$38.4/(C^{1.0})$
	C > 64 (Supercritical)	0.5	0.6	0.6

Aspect Ratio is the overall length/width ratio in the plane normal to the wind direction.
(Aspect ratio is independent of the spacing between support points of a linear appurtenance,

Note: Linear interpolation may be used for aspect ratios other than those shown.

Ice Thickness = **2.32 in** **Angle = 0 (deg)** **Equivalent Angle = 180 (deg)**

Appurtenances	Height	Width	Depth	Flat Area	Aspect Ratio	Ca	Force (lbs)	Force (lbs) (w/ Ice)	Force (lbs) (30 mph)
NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.67	1.25	**330**	**70**	**30**
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	4.47	1.29	**171**	**40**	**15**
PCS 1900MHZ 4X45W-65MHZ RRH	25.0	11.1	11.4	1.93	2.25	1.20	**62**	**17**	**6**
800 MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.22	1.20	**46**	**13**	**4**
800 MHz 2x50W RRH (Shielded)	15.8	0.4	14.0	0.04	39.50	2.48	**3**	**8**	**0**
TD-RRH8x20-25 RRH	26.1	18.6	6.7	3.37	1.40	1.20	**109**	**26**	**10**
800 External Notch Filter	8.9	8.9	3.9	0.55	1.00	1.20	**18**	**7**	**2**
800 External Notch Filter (Shielded)	8.9	0.0	3.9	0.00	0.00	1.20	**0**	**0**	**0**

Date: 6/21/2018
Project Name: Horton 2/ Fredsall Property
Project Number: 876377
Designed By: JN Checked By: MSC

HUDSON Design Group LLC

WIND LOADS

Angle =	30	(deg)	Ice Thickness =	2.32	in.	Equivalent Angle =	210	(deg)

WIND LOADS WITH NO ICE:

Appurtenances	Height	Width	Depth	Flat Area (normal)	Flat Area (side)	Aspect Ratio (normal)	Aspect Ratio	Ca (normal)	Ca (side)	Force (lbs)	Force (lbs)	Force (lbs)
NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	330	155	286
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	171	97	152
PCS 1900MHZ 4X45W-65MHZ RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	62	64	63
800 MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	46	50	47
800 MHz 2x50W RRH (Shielded)	15.8	6.5	14.0	0.71	1.54	2.43	1.13	1.20	1.20	23	50	30
TD-RRH8x20-25 RRH	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	109	41	92
800 External Notch Filter	8.9	8.9	3.9	0.55	0.24	1.00	2.28	1.20	1.20	18	8	15
800 External Notch Filter (Shielded)	8.9	4.5	3.9	0.28	0.24	2.00	2.28	1.20	1.20	9	8	9

WIND LOADS WITH ICE:

NNVV-65B-R4 Antenna	76.6	24.2	12.4	12.91	6.63	3.16	6.16	1.23	1.36	68	39	61
APXVTM14-ALU-I20 Antenna	60.9	17.2	10.9	7.30	4.63	3.53	5.57	1.25	1.34	39	27	36
PCS 1900MHZ 4X45W-65MHZ RRH	29.6	15.7	16.0	3.24	3.30	1.88	1.85	1.20	1.20	17	17	17
800 MHz 2x50W RRH	20.4	17.6	18.6	2.51	2.65	1.16	1.10	1.20	1.20	13	14	13
800 MHz 2x50W RRH (Shielded)	20.4	8.8	18.6	1.25	2.65	2.32	1.10	1.20	1.20	6	14	8
TD-RRH8x20-25 RRH	30.7	23.2	11.3	4.96	2.42	1.32	2.71	1.20	1.21	26	13	22
800 External Notch Filter	13.5	13.5	8.5	1.27	0.80	1.00	1.58	1.20	1.20	7	4	6
800 External Notch Filter (Shielded)	13.5	6.8	8.5	0.64	0.80	2.00	1.58	1.20	1.20	3	4	4

WIND LOADS AT 30 MPH:

NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	30	14	26
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	15	9	14
PCS 1900MHZ 4X45W-65MHZ RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	6	6	6
800 MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	4	4	4
800 MHz 2x50W RRH (Shielded)	15.8	6.5	14.0	0.71	1.54	2.43	1.13	1.20	1.20	2	4	3
TD-RRH8x20-25 RRH	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	10	4	8
800 External Notch Filter	8.9	8.9	3.9	0.55	0.24	1.00	2.28	1.20	1.20	2	1	1
800 External Notch Filter (Shielded)	8.9	4.5	3.9	0.28	0.24	2.00	2.28	1.20	1.20	1	1	1

Date: 6/21/2018
Project Name: Horton 2/ Fredsall Property
Project Number: 876377
Designed By: JN Checked By: MSC

HUDSON Design Group LLC

WIND LOADS

Angle =	60	(deg)	Ice Thickness =	2.32	in.	Equivalent Angle =	240	(deg)

WIND LOADS WITH NO ICE:

Appurtenances	Height	Width	Depth	Flat Area (normal)	Flat Area (side)	Ratio (normal)	Ratio (side)	Ca (normal)	Ca (side)	Force (lbs) (normal)	Force (lbs) (side)	Force (lbs) (angle)
NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	330	155	198
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	171	97	115
PCS 1900MHZ 4X45W-65MHZ RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	62	64	63
800 MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	46	50	49
800 MHz 2x50W RRH (Shielded)	15.8	9.8	14.0	1.07	1.54	1.62	1.13	1.20	1.20	35	50	46
TD-RRH8x20-25 RRH	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	109	41	58
800 External Notch Filter	8.9	8.9	3.9	0.55	0.24	1.00	2.28	1.20	1.20	18	8	10
800 External Notch Filter (Shielded)	8.9	6.7	3.9	0.41	0.24	1.33	2.28	1.20	1.20	13	8	9

WIND LOADS WITH ICE:

NNVV-65B-R4 Antenna	76.6	24.2	12.4	12.91	6.63	3.16	6.16	1.23	1.36	68	39	46
APXVTM14-ALU-I20 Antenna	60.9	17.2	10.9	7.30	4.63	3.53	5.57	1.25	1.34	39	27	30
PCS 1900MHZ 4X45W-65MHZ RRH	29.6	15.7	16.0	3.24	3.30	1.88	1.85	1.20	1.20	17	17	17
800 MHz 2x50W RRH	20.4	17.6	18.6	2.51	2.65	1.16	1.10	1.20	1.20	13	14	13
800 MHz 2x50W RRH (Shielded)	20.4	13.2	18.6	1.88	2.65	1.54	1.10	1.20	1.20	10	14	13
TD-RRH8x20-25 RRH	30.7	23.2	11.3	4.96	2.42	1.32	2.71	1.20	1.21	26	13	16
800 External Notch Filter	13.5	13.5	8.5	1.27	0.80	1.00	1.58	1.20	1.20	7	4	5
800 External Notch Filter (Shielded)	13.5	10.2	8.5	0.96	0.80	1.33	1.58	1.20	1.20	5	4	4

WIND LOADS AT 30 MPH:

NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	30	14	18
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	15	9	10
PCS 1900MHZ 4X45W-65MHZ RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	6	6	6
800 MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	4	4	4
800 MHz 2x50W RRH (Shielded)	15.8	9.8	14.0	1.07	1.54	1.62	1.13	1.20	1.20	3	4	4
TD-RRH8x20-25 RRH	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	10	4	5
800 External Notch Filter	8.9	8.9	3.9	0.55	0.24	1.00	2.28	1.20	1.20	2	1	1
800 External Notch Filter (Shielded)	8.9	6.7	3.9	0.41	0.24	1.33	2.28	1.20	1.20	1	1	1

Date: 6/21/2018
Project Name: Horton 2/ Fredsall Property
Project Number: 876377
Designed By: JN Checked By: MSC

HUDSON Design Group LLC

WIND LOADS

Angle =	90	(deg)	Ice Thickness =	2.32	in.	Equivalent Angle =	270	(deg)

WIND LOADS WITH NO ICE:

Appurtenances	Height	Width	Depth	Flat Area (normal)	Flat Area (side)	Ratio (normal)	Ratio (side)	Ca (normal)	Ca (side)	Force (lbs)	Force (lbs)	Force (lbs)
NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	330	155	155
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	171	97	97
PCS 1900MHZ 4X45W-65MHZ RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	62	64	64
800 MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	46	50	50
800 MHz 2x50W RRH (Shielded)	15.8	0.4	14.0	0.04	1.54	39.50	1.13	2.48	1.20	3	50	50
TD-RRH8x20-25 RRH	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	109	41	41
800 External Notch Filter	8.9	8.9	3.9	0.55	0.24	1.00	2.28	1.20	1.20	18	8	8
800 External Notch Filter (Shielded)	8.9	0.0	3.9	0.00	0.24	0.00	2.28	1.20	1.20	0	8	8

WIND LOADS WITH ICE:

NNVV-65B-R4 Antenna	76.6	24.2	12.4	12.91	6.63	3.16	6.16	1.23	1.36	68	39	39
APXVTM14-ALU-I20 Antenna	60.9	17.2	10.9	7.30	4.63	3.53	5.57	1.25	1.34	39	27	27
PCS 1900MHZ 4X45W-65MHZ RRH	29.6	15.7	16.0	3.24	3.30	1.88	1.85	1.20	1.20	17	17	17
800 MHz 2x50W RRH	20.4	17.6	18.6	2.51	2.65	1.16	1.10	1.20	1.20	13	14	14
800 MHz 2x50W RRH (Shielded)	20.4	5.0	18.6	0.72	2.65	4.05	1.10	1.27	1.20	4	14	14
TD-RRH8x20-25 RRH	30.7	23.2	11.3	4.96	2.42	1.32	2.71	1.20	1.21	26	13	13
800 External Notch Filter	13.5	13.5	8.5	1.27	0.80	1.00	1.58	1.20	1.20	7	4	4
800 External Notch Filter (Shielded)	13.5	4.6	8.5	0.44	0.80	2.91	1.58	1.22	1.20	2	4	4

WIND LOADS AT 30 MPH:

NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	30	14	14
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	15	9	9
PCS 1900MHZ 4X45W-65MHZ RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	6	6	6
800 MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	4	4	4
800 MHz 2x50W RRH (Shielded)	15.8	0.4	14.0	0.04	1.54	39.50	1.13	2.48	1.20	0	4	4
TD-RRH8x20-25 RRH	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	10	4	4
800 External Notch Filter	8.9	8.9	3.9	0.55	0.24	1.00	2.28	1.20	1.20	2	1	1
800 External Notch Filter (Shielded)	8.9	0.0	3.9	0.00	0.24	0.00	2.28	1.20	1.20	0	1	1

Date: 6/21/2018
Project Name: Horton 2/ Fredsall Property
Project Number: 876377
Designed By: JN Checked By: MSC

HUDSON Design Group LLC

WIND LOADS

Angle =	120	(deg)	Ice Thickness =	2.32	in.	Equivalent Angle =	300	(deg)

WIND LOADS WITH NO ICE:

Appurtenances	Height	Width	Depth	Flat Area (normal)	Flat Area (side)	Ratio (normal)	Ratio (side)	Ca (normal)	Ca (side)	Force (lbs)	Force (lbs)	Force (lbs)
NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	330	155	198
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	171	97	115
PCS 1900MHZ 4X45W-65MHZ RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	62	64	63
800 MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	46	50	49
800 MHz 2x50W RRH (Shielded)	15.8	9.8	14.0	1.07	1.54	1.62	1.13	1.20	1.20	35	50	46
TD-RRH8x20-25 RRH	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	109	41	58
800 External Notch Filter	8.9	8.9	3.9	0.55	0.24	1.00	2.28	1.20	1.20	18	8	10
800 External Notch Filter (Shielded)	8.9	6.7	3.9	0.41	0.24	1.33	2.28	1.20	1.20	13	8	9

WIND LOADS WITH ICE:

NNVV-65B-R4 Antenna	76.6	24.2	12.4	12.91	6.63	3.16	6.16	1.23	1.36	68	39	46
APXVTM14-ALU-I20 Antenna	60.9	17.2	10.9	7.30	4.63	3.53	5.57	1.25	1.34	39	27	30
PCS 1900MHZ 4X45W-65MHZ RRH	29.6	15.7	16.0	3.24	3.30	1.88	1.85	1.20	1.20	17	17	17
800 MHz 2x50W RRH	20.4	17.6	18.6	2.51	2.65	1.16	1.10	1.20	1.20	13	14	13
800 MHz 2x50W RRH (Shielded)	20.4	13.2	18.6	1.88	2.65	1.54	1.10	1.20	1.20	10	14	13
TD-RRH8x20-25 RRH	30.7	23.2	11.3	4.96	2.42	1.32	2.71	1.20	1.21	26	13	16
800 External Notch Filter	13.5	13.5	8.5	1.27	0.80	1.00	1.58	1.20	1.20	7	4	5
800 External Notch Filter (Shielded)	13.5	10.2	8.5	0.96	0.80	1.33	1.58	1.20	1.20	5	4	4

WIND LOADS AT 30 MPH:

NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	30	14	18
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	15	9	10
PCS 1900MHZ 4X45W-65MHZ RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	6	6	6
800 MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	4	4	4
800 MHz 2x50W RRH (Shielded)	15.8	9.8	14.0	1.07	1.54	1.62	1.13	1.20	1.20	3	4	4
TD-RRH8x20-25 RRH	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	10	4	5
800 External Notch Filter	8.9	8.9	3.9	0.55	0.24	1.00	2.28	1.20	1.20	2	1	1
800 External Notch Filter (Shielded)	8.9	6.7	3.9	0.41	0.24	1.33	2.28	1.20	1.20	1	1	1

Date: 6/21/2018
Project Name: Horton 2/ Fredsall Property
Project Number: 876377
Designed By: JN Checked By: MSC

HUDSON Design Group LLC

WIND LOADS

Angle =	150	(deg)	Ice Thickness =	2.32	in.	Equivalent Angle =	330	(deg)

WIND LOADS WITH NO ICE:

Appurtenances	Height	Width	Depth	Flat Area (normal)	Flat Area (side)	Ratio (normal)	Ratio (side)	Ca (normal)	Ca (side)	Force (lbs)	Force (lbs)	Force (lbs)
NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	330	155	286
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	171	97	152
PCS 1900MHZ 4X45W-65MHZ RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	62	64	63
800 MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	46	50	47
800 MHz 2x50W RRH (Shielded)	15.8	6.5	14.0	0.71	1.54	2.43	1.13	1.20	1.20	23	50	30
TD-RRH8x20-25 RRH	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	109	41	92
800 External Notch Filter	8.9	8.9	3.9	0.55	0.24	1.00	2.28	1.20	1.20	18	8	15
800 External Notch Filter (Shielded)	8.9	4.5	3.9	0.28	0.24	2.00	2.28	1.20	1.20	9	8	9

WIND LOADS WITH ICE:

NNVV-65B-R4 Antenna	76.6	24.2	12.4	12.91	6.63	3.16	6.16	1.23	1.36	68	39	61
APXVTM14-ALU-I20 Antenna	60.9	17.2	10.9	7.30	4.63	3.53	5.57	1.25	1.34	39	27	36
PCS 1900MHZ 4X45W-65MHZ RRH	29.6	15.7	16.0	3.24	3.30	1.88	1.85	1.20	1.20	17	17	17
800 MHz 2x50W RRH	20.4	17.6	18.6	2.51	2.65	1.16	1.10	1.20	1.20	13	14	13
800 MHz 2x50W RRH (Shielded)	20.4	8.8	18.6	1.25	2.65	2.32	1.10	1.20	1.20	6	14	8
TD-RRH8x20-25 RRH	30.7	23.2	11.3	4.96	2.42	1.32	2.71	1.20	1.21	26	13	22
800 External Notch Filter	13.5	13.5	8.5	1.27	0.80	1.00	1.58	1.20	1.20	7	4	6
800 External Notch Filter (Shielded)	13.5	6.8	8.5	0.64	0.80	2.00	1.58	1.20	1.20	3	4	4

WIND LOADS AT 30 MPH:

NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	30	14	26
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	15	9	14
PCS 1900MHZ 4X45W-65MHZ RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	6	6	6
800 MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	4	4	4
800 MHz 2x50W RRH (Shielded)	15.8	6.5	14.0	0.71	1.54	2.43	1.13	1.20	1.20	2	4	3
TD-RRH8x20-25 RRH	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	10	4	8
800 External Notch Filter	8.9	8.9	3.9	0.55	0.24	1.00	2.28	1.20	1.20	2	1	1
800 External Notch Filter (Shielded)	8.9	4.5	3.9	0.28	0.24	2.00	2.28	1.20	1.20	1	1	1

Date: 6/21/2018
Project Name: Horton 2/ Fredsall Property
Project Number: 876377
Designed By: JN **Checked By:** MSC

HUDSON Design Group LLC

ICE WEIGHT CALCULATIONS

Thickness of ice: 1 in.
Density of ice: 56 pcf

NNVV-65B-R4 Antenna

Weight of ice based on total radial SF area:

Height (in):	72.0	
Width (in):	19.6	
Depth (in):	7.8	
Total weight of ice on object:		151 lbs
Weight of object:	78 lbs	
Combined weight of ice and object:		229 lbs

APXVTM14-ALU-I20 Antenna

Weight of ice based on total radial SF area:

Height (in):	56.3	
Width (in):	12.6	
Depth (in):	6.3	
Total weight of ice on object:		84 lbs
Weight of object:	57 lbs	
Combined weight of ice and object:		141 lbs

PCS 1900MHz 4X45W-65MHz RRH

Weight of ice based on total radial SF area:

Height (in):	25.0	
Width (in):	11.1	
Depth (in):	11.4	
Total weight of ice on object:		51 lbs
Weight of object:	60 lbs	
Combined weight of ice and object:		111 lbs

800 MHz 2x50W RRH

Weight of ice based on total radial SF area:

Height (in):	15.8	
Width (in):	13.0	
Depth (in):	14.0	
Total weight of ice on object:		45 lbs
Weight of object:	64 lbs	
Combined weight of ice and object:		109 lbs

TD-RRH8x20-25 RRH

Weight of ice based on total radial SF area:

Height (in):	26.1	
Width (in):	18.6	
Depth (in):	6.7	
Total weight of ice on object:		58 lbs
Weight of object:	70 lbs	
Combined weight of ice and object:		128 lbs

800 External Notch Filter

Weight of ice based on total radial SF area:

Height (in):	8.9	
Width (in):	8.9	
Depth (in):	3.9	
Total weight of ice on object:		13 lbs
Weight of object:	11 lbs	
Combined weight of ice and object:		24 lbs

L3x3x1/4 Angles

Weight of ice based on total radial SF area:

Height (in):	3	
Width (in):	3	
Per foot weight of ice on object:		6 plf

HSS 4x4x1/4

Weight of ice based on total radial SF area:

Height (in):	4	
Width (in):	4	
Per foot weight of ice on object:		8 plf

2" pipe

Per foot weight of ice:

diameter (in):	2.38	
Per foot weight of ice on object:		4 plf

Bentley **Hewlett-Packard Company**

Current Date: 6/21/2018 10:06 AM
Units system: English
File name: W:\STRUCTURAL DEPARTMENT\ANALYSIS SOFTWARE\RAM Elements\RAM Projects\CROWN CASTLE\876377\876377.etz\

Load data

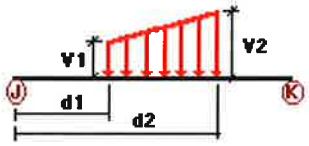
GLOSSARY

Comb : Indicates if load condition is a load combination

Load Conditions

Condition	Description	Comb.	Category
DL	Dead Load	No	DL
W0	Wind Load 0/60/120 deg	No	WIND
W30	Wind Load 30/90/150 deg	No	WIND
Di	Ice Load	No	LL
Wi0	Ice Wind Load 0/60/120 deg	No	WIND
Wi30	Ice Wind Load 30/90/150 deg	No	WIND
WL0	WL 30 mph 0/60/120 deg	No	WIND
WL30	WL 30 mph 30/90/150 deg	No	WIND
LL1	250 lb Live Load Center of Mount	No	LL
LL2	250 lb Live Load End of Mount	No	LL
LLa1	500 lb Live Load Antenna 1	No	LL
LLa2	500 lb Live Load Antenna 2	No	LL

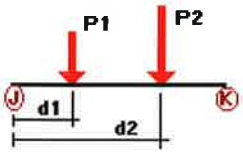
Distributed force on members



Condition	Member	Dir1	Val1 [Kip/ft]	Val2 [Kip/ft]	Dist1 [ft]	%	Dist2 [ft]	%
DL	1	Y	-0.01	0.00	0.00	No	0.00	No
	2	Y	-0.01	0.00	0.00	No	0.00	No
	3	Y	-0.01	0.00	0.00	No	0.00	No
	36	Y	-0.01	0.00	0.00	No	0.00	No
	37	Y	-0.01	0.00	0.00	No	0.00	No
	38	Y	-0.01	0.00	0.00	No	0.00	No
	39	Y	-0.01	0.00	0.00	No	0.00	No
	40	Y	-0.01	0.00	0.00	No	0.00	No
	41	Y	-0.01	0.00	0.00	No	0.00	No
	42	Y	-0.01	0.00	0.00	No	0.00	No
	43	Y	-0.01	0.00	0.00	No	0.00	No
	44	Y	-0.01	0.00	0.00	No	0.00	No
W0	1	z	-0.013	0.00	0.00	No	0.00	No
	2	z	-0.013	0.00	0.00	No	0.00	No
	3	z	-0.013	0.00	0.00	No	0.00	No
	11	z	-0.006	0.00	0.00	No	0.00	No
	26	z	-0.006	0.00	0.00	No	0.00	No

	31	z	-0.006	0.00	0.00	No	0.00	No
	45	z	-0.013	0.00	0.00	No	0.00	No
	46	z	-0.013	0.00	0.00	No	0.00	No
	47	z	-0.013	0.00	0.00	No	0.00	No
	48	z	-0.006	0.00	0.00	No	0.00	No
	49	z	-0.006	0.00	0.00	No	0.00	No
	50	z	-0.006	0.00	0.00	No	0.00	No
	51	z	-0.006	0.00	0.00	No	0.00	No
	52	z	-0.006	0.00	0.00	No	0.00	No
	53	z	-0.006	0.00	0.00	No	0.00	No
W30	2	x	-0.013	0.00	0.00	No	0.00	No
	3	x	-0.013	0.00	0.00	No	0.00	No
	11	x	-0.006	0.00	0.00	No	0.00	No
	26	x	-0.006	0.00	0.00	No	0.00	No
	31	x	-0.006	0.00	0.00	No	0.00	No
	45	x	-0.013	0.00	0.00	No	0.00	No
	46	x	-0.013	0.00	0.00	No	0.00	No
	47	x	-0.013	0.00	0.00	No	0.00	No
	48	x	-0.006	0.00	0.00	No	0.00	No
	49	x	-0.006	0.00	0.00	No	0.00	No
	50	x	-0.006	0.00	0.00	No	0.00	No
	51	x	-0.006	0.00	0.00	No	0.00	No
	53	x	-0.006	0.00	0.00	No	0.00	No
Di	1	y	-0.006	0.00	0.00	No	0.00	No
	2	y	-0.006	0.00	0.00	No	0.00	No
	3	y	-0.006	0.00	0.00	No	0.00	No
	8	y	-0.004	0.00	0.00	No	0.00	No
	11	y	-0.004	0.00	0.00	No	0.00	No
	12	y	-0.004	0.00	0.00	No	0.00	No
	24	y	-0.004	0.00	0.00	No	0.00	No
	25	y	-0.004	0.00	0.00	No	0.00	No
	26	y	-0.004	0.00	0.00	No	0.00	No
	29	y	-0.004	0.00	0.00	No	0.00	No
	30	y	-0.004	0.00	0.00	No	0.00	No
	31	y	-0.004	0.00	0.00	No	0.00	No
	36	y	-0.006	0.00	0.00	No	0.00	No
	37	y	-0.006	0.00	0.00	No	0.00	No
	38	y	-0.006	0.00	0.00	No	0.00	No
	39	y	-0.012	0.00	0.00	No	0.00	No
	40	y	-0.012	0.00	0.00	No	0.00	No
	41	y	-0.012	0.00	0.00	No	0.00	No
	42	y	-0.008	0.00	0.00	No	0.00	No
	43	y	-0.008	0.00	0.00	No	0.00	No
	44	y	-0.008	0.00	0.00	No	0.00	No
	45	y	-0.012	0.00	0.00	No	0.00	No
	46	y	-0.012	0.00	0.00	No	0.00	No
	47	y	-0.012	0.00	0.00	No	0.00	No
	48	y	-0.004	0.00	0.00	No	0.00	No
	49	y	-0.004	0.00	0.00	No	0.00	No
	50	y	-0.004	0.00	0.00	No	0.00	No
	51	y	-0.004	0.00	0.00	No	0.00	No
	52	y	-0.004	0.00	0.00	No	0.00	No
	53	y	-0.004	0.00	0.00	No	0.00	No

Concentrated forces on members



Condition	Member	Dir1	Value1 [Kip]	Dist1 [ft]	%
DL	8	y	-0.039	0.50	No
		y	-0.039	5.50	No
		y	-0.011	3.00	No
	11	y	-0.07	1.50	No
	12	y	-0.029	0.50	No
		y	-0.029	4.50	No
		y	-0.064	3.00	No
	24	y	-0.029	0.50	No
		y	-0.029	4.50	No
		y	-0.064	3.00	No
	25	y	-0.039	0.50	No
		y	-0.039	5.50	No
		y	-0.011	3.00	No
	26	y	-0.07	1.50	No
	29	y	-0.029	0.50	No
		y	-0.029	4.50	No
		y	-0.064	3.00	No
	30	y	-0.039	0.50	No
		y	-0.039	5.50	No
		y	-0.011	3.00	No
	31	y	-0.07	1.50	No
	48	y	-0.06	1.00	No
		y	-0.064	1.50	No
	49	y	-0.06	1.00	No
		y	-0.064	1.50	No
	50	y	-0.06	1.00	No
		y	-0.064	1.50	No
W0	8	z	-0.10	0.50	No
		z	-0.10	5.50	No
		z	-0.009	3.00	No
	11	z	-0.058	1.50	No
	12	z	-0.058	0.50	No
		z	-0.058	4.50	No
		z	-0.046	3.00	No
	24	z	-0.058	0.50	No
		z	-0.058	4.50	No
		z	-0.046	3.00	No
	25	z	-0.10	0.50	No
		z	-0.10	5.50	No
		z	-0.009	3.00	No
	26	z	-0.058	1.50	No
	29	z	-0.086	0.50	No
		z	-0.086	4.50	No
		z	-0.003	3.00	No
	30	z	-0.165	0.50	No
		z	-0.165	5.50	No
	31	z	-0.109	1.50	No
	48	z	-0.063	1.00	No
		z	-0.049	1.50	No
	49	z	-0.063	1.00	No
		z	-0.049	1.50	No
	50	z	-0.064	1.00	No
		z	-0.05	1.50	No
W30	8	x	-0.144	0.50	No

		x	-0.144	5.50	No
		x	-0.009	3.00	No
	11	x	-0.092	1.50	No
	12	x	-0.077	0.50	No
		x	-0.077	4.50	No
		x	-0.03	3.00	No
	24	x	-0.077	0.50	No
		x	-0.077	4.50	No
		x	-0.03	3.00	No
	25	x	-0.144	0.50	No
		x	-0.144	5.50	No
		x	-0.009	3.00	No
	26	x	-0.092	1.50	No
	29	x	-0.049	0.50	No
		x	-0.049	4.50	No
		x	-0.05	3.00	No
	30	x	-0.078	0.50	No
		x	-0.078	5.50	No
		x	-0.008	3.00	No
	31	x	-0.041	1.50	No
	48	x	-0.063	1.00	No
		x	-0.047	1.50	No
	49	x	-0.063	1.00	No
		x	-0.047	1.50	No
	50	x	-0.062	1.00	No
		x	-0.046	1.50	No
Di	8	y	-0.076	0.50	No
		y	-0.076	5.50	No
		y	-0.013	3.00	No
	11	y	-0.058	1.50	No
	12	y	-0.042	0.50	No
		y	-0.042	4.50	No
		y	-0.045	3.00	No
	24	y	-0.042	0.50	No
		y	-0.042	4.50	No
		y	-0.045	3.00	No
	25	y	-0.076	0.50	No
		y	-0.076	5.50	No
		y	-0.013	3.00	No
	26	y	-0.058	1.50	No
	29	y	-0.042	0.50	No
		y	-0.042	4.50	No
		y	-0.045	3.00	No
	30	y	-0.076	0.50	No
		y	-0.076	5.50	No
		y	-0.013	3.00	No
	31	y	-0.058	1.50	No
	48	y	-0.051	1.00	No
		y	-0.045	1.50	No
	49	y	-0.051	1.00	No
		y	-0.045	1.50	No
	50	y	-0.051	1.00	No
		y	-0.045	1.50	No
Wi0	8	z	-0.024	0.50	No
		z	-0.024	5.50	No
		z	-0.005	3.00	No
	11	z	-0.016	1.50	No
	12	z	-0.015	0.50	No
		z	-0.015	4.50	No
		z	-0.013	3.00	No

	24	z	-0.015	0.50	No
		z	-0.015	4.50	No
		z	-0.013	3.00	No
	25	z	-0.024	0.50	No
		z	-0.024	5.50	No
		z	-0.005	3.00	No
	26	z	-0.016	1.50	No
	29	z	-0.021	0.50	No
		z	-0.021	4.50	No
		z	-0.013	3.00	No
	30	z	-0.035	0.50	No
		z	-0.035	5.50	No
		z	-0.007	3.00	No
	31	z	-0.026	1.50	No
	48	z	-0.017	1.00	No
		z	-0.013	1.50	No
	49	z	-0.017	1.00	No
		z	-0.013	1.50	No
	50	z	-0.017	1.00	No
		z	-0.014	1.50	No
Wi30	8	x	-0.031	0.50	No
		x	-0.031	5.50	No
		x	-0.006	3.00	No
	11	x	-0.022	1.50	No
	12	x	-0.018	0.50	No
		x	-0.018	4.50	No
		x	-0.013	3.00	No
	24	x	-0.018	0.50	No
		x	-0.018	4.50	No
		x	-0.013	3.00	No
	25	x	-0.031	0.50	No
		x	-0.031	5.50	No
		x	-0.006	3.00	No
	26	x	-0.022	1.50	No
	29	x	-0.014	0.50	No
		x	-0.014	4.50	No
		x	-0.014	3.00	No
	30	x	-0.02	0.50	No
		x	-0.02	5.50	No
		x	-0.004	3.00	No
	31	x	-0.013	1.50	No
	48	x	-0.017	1.00	No
		x	-0.013	1.50	No
	49	x	-0.017	1.00	No
		x	-0.013	1.50	No
	50	x	-0.017	1.00	No
		x	-0.013	1.50	No
WL0	8	z	-0.009	0.50	No
		z	-0.009	5.50	No
		z	-0.001	3.00	No
	11	z	-0.006	1.50	No
	12	z	-0.006	0.50	No
		z	-0.006	4.50	No
		z	-0.005	3.00	No
	24	z	-0.006	0.50	No
		z	-0.006	4.50	No
		z	-0.005	3.00	No
	25	z	-0.009	0.50	No
		z	-0.009	5.50	No
		z	-0.001	3.00	No

	26	z	-0.006	1.50	No
	29	z	-0.008	0.50	No
		z	-0.008	4.50	No
		z	-0.005	3.00	No
	30	z	-0.015	0.50	No
		z	-0.015	5.50	No
		z	-0.002	3.00	No
	31	z	-0.01	1.50	No
	48	z	-0.006	1.00	No
		z	-0.005	1.50	No
	49	z	-0.006	1.00	No
		z	-0.005	1.50	No
	50	z	-0.006	1.00	No
		z	-0.005	1.50	No
WL30	8	x	-0.013	0.50	No
		x	-0.013	5.50	No
		x	-0.002	3.00	No
	11	x	-0.009	1.50	No
	12	x	-0.007	0.50	No
		x	-0.007	4.50	No
		x	-0.005	3.00	No
	24	x	-0.007	0.50	No
		x	-0.007	4.50	No
		x	-0.005	3.00	No
	25	x	-0.013	0.50	No
		x	-0.013	5.50	No
		x	-0.002	3.00	No
	26	x	-0.009	1.50	No
	29	x	-0.005	0.50	No
		x	-0.005	4.50	No
		x	-0.005	3.00	No
	30	x	-0.007	0.50	No
		x	-0.007	5.50	No
		x	-0.001	3.00	No
	31	x	-0.004	1.50	No
	48	x	-0.006	1.00	No
		x	-0.005	1.50	No
	49	x	-0.006	1.00	No
		x	-0.005	1.50	No
	50	x	-0.006	1.00	No
		x	-0.005	1.50	No
LL1	1	y	-0.25	50.00	Yes
LL2	1	y	-0.25	0.00	Yes
LLa1	30	y	-0.50	50.00	Yes
LLa2	29	y	-0.50	50.00	Yes

Self weight multipliers for load conditions

Condition	Description	Self weight multiplier			
		Comb.	MultX	MultY	MultZ
DL	Dead Load	No	0.00	-1.00	0.00
W0	Wind Load 0/60/120 deg	No	0.00	0.00	0.00
W30	Wind Load 30/90/150 deg	No	0.00	0.00	0.00
Di	Ice Load	No	0.00	0.00	0.00
Wi0	Ice Wind Load 0/60/120 deg	No	0.00	0.00	0.00

Wi30	Ice Wind Load 30/90/150 deg	No	0.00	0.00	0.00
WL0	WL 30 mph 0/60/120 deg	No	0.00	0.00	0.00
WL30	WL 30 mph 30/90/150 deg	No	0.00	0.00	0.00
LL1	250 lb Live Load Center of Mount	No	0.00	0.00	0.00
LL2	250 lb Live Load End of Mount	No	0.00	0.00	0.00
LLa1	500 lb Live Load Antenna 1	No	0.00	0.00	0.00
LLa2	500 lb Live Load Antenna 2	No	0.00	0.00	0.00

Earthquake (Dynamic analysis only)

Condition	a/g	Ang. [Deg]	Damp. [%]
DL	0.00	0.00	0.00
W0	0.00	0.00	0.00
W30	0.00	0.00	0.00
Di	0.00	0.00	0.00
Wi0	0.00	0.00	0.00
Wi30	0.00	0.00	0.00
WL0	0.00	0.00	0.00
WL30	0.00	0.00	0.00
LL1	0.00	0.00	0.00
LL2	0.00	0.00	0.00
LLa1	0.00	0.00	0.00
LLa2	0.00	0.00	0.00

Current Date: 6/21/2018 10:06 AM
Units system: English
File name: W:\STRUCTURAL DEPARTMENT\ANALYSIS SOFTWARE\RAM Elements\RAM Projects\CROWN CASTLE\876377\876377.etz\

Geometry data

GLOSSARY

Cb22, Cb33	: Moment gradient coefficients
Cm22, Cm33	: Coefficients applied to bending term in interaction formula
d0	: Tapered member section depth at J end of member
DJX	: Rigid end offset distance measured from J node in axis X
DJY	: Rigid end offset distance measured from J node in axis Y
DJZ	: Rigid end offset distance measured from J node in axis Z
DKX	: Rigid end offset distance measured from K node in axis X
DKY	: Rigid end offset distance measured from K node in axis Y
DKZ	: Rigid end offset distance measured from K node in axis Z
dL	: Tapered member section depth at K end of member
Ig factor	: Inertia reduction factor (Effective Inertia/Gross Inertia) for reinforced concrete members
K22	: Effective length factor about axis 2
K33	: Effective length factor about axis 3
L22	: Member length for calculation of axial capacity
L33	: Member length for calculation of axial capacity
LB pos	: Lateral unbraced length of the compression flange in the positive side of local axis 2
LB neg	: Lateral unbraced length of the compression flange in the negative side of local axis 2
RX	: Rotation about X
RY	: Rotation about Y
RZ	: Rotation about Z
TO	: 1 = Tension only member 0 = Normal member
TX	: Translation in X
TY	: Translation in Y
TZ	: Translation in Z

Nodes

Node	X [ft]	Y [ft]	Z [ft]	Rigid Floor
1	0.00	0.00	0.00	0
3	7.65E-05	0.00	-6.9282	0
4	6.0001	0.00	3.4641	0
11	-6.0001	0.00	3.4641	0
24	3.1733	2.00	-1.8321	0
25	3.1733	-4.00	-1.8321	0
30	0.4231	2.00	-6.5952	0
31	0.4231	-4.00	-6.5952	0
32	5.9232	2.00	2.9312	0
33	5.9232	-4.00	2.9312	0
58	-0.4231	-4.00	-6.5952	0
59	-0.4231	2.00	-6.5952	0
60	-3.1733	-4.00	-1.8321	0
61	-3.1733	2.00	-1.8321	0
63	-5.9232	-4.00	2.9312	0
66	-5.9232	2.00	2.9312	0
69	-5.5001	-4.00	3.6641	0
70	-5.5001	2.00	3.6641	0
71	0.00	-4.00	3.6642	0
72	0.00	2.00	3.6642	0
74	5.5001	-4.00	3.6641	0
77	5.5001	2.00	3.6641	0

85	-0.0001	0.00	-3.9283	0
90	-3.402	0.00	1.9643	0
94	3.4021	0.00	1.9641	0
95	1.4127	0.00	-0.8156	0
98	-1.4127	0.00	-0.8156	0
99	0.00	0.00	1.6312	0
103	-0.866	-2.50	0.50	0
104	0.866	-2.50	0.50	0
105	0.00	-2.50	-1.00	0
106	-4.701	0.00	2.7143	0
107	4.7011	0.00	2.7141	0
108	-0.0001	0.00	-5.4283	0
109	0.00	0.00	2.8532	0
111	2.4709	0.00	-1.4266	0
113	-2.4709	0.00	-1.4266	0
114	0.00	3.00	2.8532	0
115	-2.4709	3.00	-1.4266	0
116	2.4709	3.00	-1.4266	0
123	5.875	1.50	3.2476	0
124	5.7501	1.50	3.4641	0
134	-5.875	1.50	3.2476	0
135	-5.7501	1.50	3.4641	0
141	0.125	1.50	-6.7117	0
144	-0.1249	1.50	-6.7117	0
10	-3.0001	0.00	-1.7321	0
12	0.00	0.00	3.4642	0
2	3.0001	0.00	-1.7321	0

Restraints

Node	TX	TY	TZ	RX	RY	RZ
95	1	1	1	1	1	1
98	1	1	1	1	1	1
99	1	1	1	1	1	1
103	1	1	1	1	1	1
104	1	1	1	1	1	1
105	1	1	1	1	1	1

Members

Member	NJ	NK	Description	Section	Material	d0 [in]	dL [in]	lg factor
1	11	4		L 3X3X1_4	A36	0.00	0.00	0.00
2	11	3		L 3X3X1_4	A36	0.00	0.00	0.00
3	3	4		L 3X3X1_4	A36	0.00	0.00	0.00
8	24	25		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
11	30	31		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
12	32	33		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
24	59	58		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
25	61	60		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
26	66	63		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00

29	70	69	PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
30	72	71	PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
31	77	74	PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
36	94	90	L 3X3X1_4	A36	0.00	0.00	0.00
37	90	85	L 3X3X1_4	A36	0.00	0.00	0.00
38	94	85	L 3X3X1_4	A36	0.00	0.00	0.00
39	4	94	T2L 3X3X1_4	A36	0.00	0.00	0.00
40	90	11	T2L 3X3X1_4	A36	0.00	0.00	0.00
41	85	3	T2L 3X3X1_4	A36	0.00	0.00	0.00
42	99	12	HSS_SQR 4X4X1_4	A500 GrB rectangular	0.00	0.00	0.00
43	98	10	HSS_SQR 4X4X1_4	A500 GrB rectangular	0.00	0.00	0.00
44	2	95	HSS_SQR 4X4X1_4	A500 GrB rectangular	0.00	0.00	0.00
45	108	105	T2L 3X3X1_4X3_8	A36	0.00	0.00	0.00
46	104	107	T2L 3X3X1_4X3_8	A36	0.00	0.00	0.00
47	103	106	T2L 3X3X1_4X3_8	A36	0.00	0.00	0.00
48	115	113	PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
49	116	111	PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
50	114	109	PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
51	144	134	PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
52	135	124	PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
53	123	141	PIPE 2x0.154	A53 GrB	0.00	0.00	0.00

Orientation of local axes

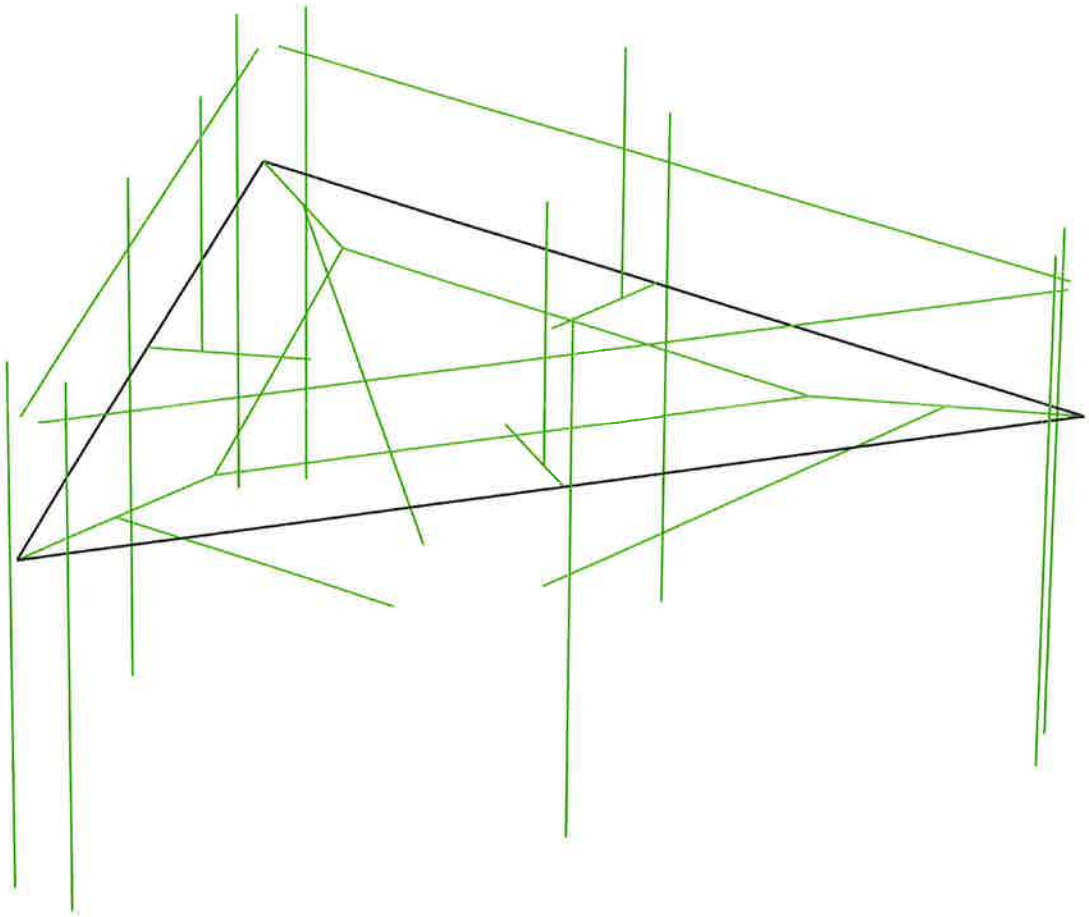
Member	Rotation [Deg]	Axes23	NX	NY	NZ
1	270.00	0	0.00	0.00	0.00
8	0.00	2	0.50	0.00	0.866
11	0.00	2	0.50	0.00	0.866
12	0.00	2	0.50	0.00	0.866
24	0.00	2	0.50	0.00	-0.866
25	0.00	2	0.50	0.00	-0.866
26	0.00	2	0.50	0.00	-0.866
36	270.00	0	0.00	0.00	0.00
37	270.00	0	0.00	0.00	0.00
39	180.00	0	0.00	0.00	0.00
40	180.00	0	0.00	0.00	0.00
41	180.00	0	0.00	0.00	0.00

APPENDIX C

RAM ELEMENTS ANALYSIS OUTPUT

Design status

- Not designed
- Error on design
- Design O.K.
- With warnings



Bentley Hewlett-Packard Company

Current Date: 6/21/2018 9:54 AM
Units system: English
File name: W:\STRUCTURAL DEPARTMENT\ANALYSIS SOFTWARE\RAM Elements\RAM Projects\CROWN CASTLE\876377\876377.etz\

Steel Code Check

Report: Summary - For all selected load conditions

Load conditions to be included in design :

LC1=1.2DL+1.6W0
LC2=1.2DL+1.6W30
LC3=1.2DL-1.6W0
LC4=1.2DL-1.6W30
LC5=0.9DL+1.6W0
LC6=0.9DL+1.6W30
LC7=0.9DL-1.6W0
LC8=0.9DL-1.6W30
LC9=1.2DL+Di+Wi0
LC10=1.2DL+Di+Wi30
LC11=1.2DL+Di-Wi0
LC12=1.2DL+Di-Wi30
LC13=1.2DL
LC14=0.9DL
LC15=1.2DL+1.5LL1
LC16=1.2DL+1.5LL2
LC17=1.2DL+WL0+1.5LLa1
LC18=1.2DL+WL30+1.5LLa1
LC19=1.2DL-WL0+1.5LLa1
LC20=1.2DL-WL30+1.5LLa1
LC21=1.2DL+WL0+1.5LLa2
LC22=1.2DL+WL30+1.5LLa2
LC23=1.2DL-WL0+1.5LLa2
LC24=1.2DL-WL30+1.5LLa2

Description	Section	Member	Ctrl Eq.	Ratio	Status	Reference
	HSS_SQR 4X4X1_4	**42**	LC1 at 0.00%	0.09	OK	
			LC10 at 0.00%	0.14	OK	
			LC11 at 0.00%	0.13	OK	
			LC12 at 0.00%	0.14	OK	
			LC13 at 0.00%	0.08	OK	
			LC14 at 0.00%	0.06	OK	
			LC15 at 0.00%	0.14	OK	
			LC16 at 0.00%	0.10	OK	
			LC17 at 0.00%	0.21	OK	
			LC18 at 0.00%	**0.21**	**OK**	Eq. H1-1b
			LC19 at 0.00%	0.21	OK	
			LC2 at 0.00%	0.11	OK	
			LC20 at 0.00%	0.21	OK	
			LC21 at 0.00%	0.13	OK	
			LC22 at 0.00%	0.13	OK	
			LC23 at 0.00%	0.13	OK	
			LC24 at 0.00%	0.13	OK	
			LC3 at 0.00%	0.07	OK	
			LC4 at 0.00%	0.11	OK	
			LC5 at 0.00%	0.07	OK	
			LC6 at 0.00%	0.09	OK	
			LC7 at 0.00%	0.06	OK	
			LC8 at 0.00%	0.09	OK	
			LC9 at 0.00%	0.14	OK	

	43	LC1 at 0.00%	0.13	OK	
		LC10 at 0.00%	0.13	OK	
		LC11 at 0.00%	0.14	OK	
		LC12 at 0.00%	0.14	OK	
		LC13 at 0.00%	0.08	OK	
		LC14 at 0.00%	0.06	OK	
		LC15 at 0.00%	0.08	OK	
		LC16 at 0.00%	0.09	OK	
		LC17 at 0.00%	0.08	OK	
		LC18 at 0.00%	0.08	OK	
		LC19 at 0.00%	0.08	OK	
		LC2 at 0.00%	0.13	OK	
		LC20 at 0.00%	0.08	OK	
		LC21 at 0.00%	0.10	OK	
		LC22 at 0.00%	0.11	OK	
		LC23 at 0.00%	0.11	OK	
		LC24 at 0.00%	0.10	OK	
		LC3 at 0.00%	0.13	OK	
		LC4 at 0.00%	**0.15**	**OK**	Eq. H1-1b
		LC5 at 0.00%	0.11	OK	
		LC6 at 0.00%	0.11	OK	
		LC7 at 0.00%	0.11	OK	
		LC8 at 0.00%	0.13	OK	
		LC9 at 0.00%	0.14	OK	
	44	LC1 at 100.00%	0.13	OK	
		LC10 at 100.00%	0.14	OK	
		LC11 at 100.00%	0.14	OK	
		LC12 at 100.00%	0.14	OK	
		LC13 at 100.00%	0.08	OK	
		LC14 at 100.00%	0.06	OK	
		LC15 at 100.00%	0.08	OK	
		LC16 at 100.00%	0.08	OK	
		LC17 at 100.00%	0.08	OK	
		LC18 at 100.00%	0.08	OK	
		LC19 at 100.00%	0.08	OK	
		LC2 at 100.00%	**0.15**	**OK**	Eq. H1-1b
		LC20 at 100.00%	0.08	OK	
		LC21 at 100.00%	0.08	OK	
		LC22 at 100.00%	0.08	OK	
		LC23 at 100.00%	0.08	OK	
		LC24 at 100.00%	0.08	OK	
		LC3 at 100.00%	0.14	OK	
		LC4 at 100.00%	0.13	OK	
		LC5 at 100.00%	0.11	OK	
		LC6 at 100.00%	0.13	OK	
		LC7 at 100.00%	0.12	OK	
		LC8 at 100.00%	0.11	OK	
		LC9 at 100.00%	0.14	OK	
L 3X3X1_4	**1**	LC1 at 100.00%	0.25	With warnings	Eq. H3-8
		LC10 at 100.00%	0.27	With warnings	Eq. H2-1
		LC11 at 0.00%	0.27	With warnings	
		LC12 at 100.00%	0.26	With warnings	
		LC13 at 100.00%	0.17	With warnings	
		LC14 at 100.00%	0.13	With warnings	
		LC15 at 100.00%	0.17	With warnings	
		LC16 at 0.00%	0.26	With warnings	
		LC17 at 100.00%	0.18	With warnings	
		LC18 at 100.00%	0.18	With warnings	
		LC19 at 0.00%	0.18	With warnings	
		LC2 at 0.00%	0.24	With warnings	
		LC20 at 100.00%	0.18	With warnings	
		LC21 at 0.00%	0.46	With warnings	

	LC22 at 0.00%	0.48	With warnings	
	LC23 at 0.00%	**0.51**	**With warnings**	Eq. H3-8
	LC24 at 0.00%	0.48	With warnings	
	LC3 at 0.00%	0.31	With warnings	
	LC4 at 100.00%	0.19	With warnings	
	LC5 at 100.00%	0.23	With warnings	
	LC6 at 0.00%	0.21	With warnings	
	LC7 at 0.00%	0.31	With warnings	
	LC8 at 100.00%	0.16	With warnings	
	LC9 at 100.00%	0.26	With warnings	
2	LC1 at 100.00%	0.36	With warnings	Eq. H2-1
	LC10 at 100.00%	0.27	With warnings	
	LC11 at 0.00%	0.26	With warnings	
	LC12 at 0.00%	0.27	With warnings	
	LC13 at 0.00%	0.17	With warnings	
	LC14 at 0.00%	0.13	With warnings	
	LC15 at 0.00%	0.17	With warnings	
	LC16 at 0.00%	0.26	With warnings	
	LC17 at 0.00%	0.19	With warnings	
	LC18 at 0.00%	0.18	With warnings	
	LC19 at 0.00%	0.18	With warnings	
	LC2 at 0.00%	0.34	With warnings	
	LC20 at 0.00%	0.18	With warnings	
	LC21 at 0.00%	**0.43**	**With warnings**	Eq. H2-1
	LC22 at 0.00%	0.43	With warnings	
	LC23 at 0.00%	0.42	With warnings	
	LC24 at 0.00%	0.43	With warnings	
	LC3 at 100.00%	0.16	With warnings	
	LC4 at 0.00%	0.23	With warnings	
	LC5 at 100.00%	0.34	With warnings	
	LC6 at 0.00%	0.32	With warnings	
	LC7 at 100.00%	0.16	With warnings	
	LC8 at 0.00%	0.23	With warnings	
	LC9 at 0.00%	0.27	With warnings	
3	LC1 at 0.00%	0.30	With warnings	Eq. H2-1
	LC10 at 0.00%	0.26	With warnings	
	LC11 at 0.00%	0.27	With warnings	
	LC12 at 100.00%	0.27	With warnings	Eq. H2-1
	LC13 at 0.00%	0.17	With warnings	
	LC14 at 0.00%	0.13	With warnings	
	LC15 at 100.00%	0.17	With warnings	
	LC16 at 0.00%	0.17	With warnings	
	LC17 at 100.00%	0.18	With warnings	
	LC18 at 100.00%	0.18	With warnings	
	LC19 at 100.00%	0.18	With warnings	
	LC2 at 0.00%	0.24	With warnings	
	LC20 at 100.00%	0.19	With warnings	
	LC21 at 100.00%	0.17	With warnings	
	LC22 at 100.00%	0.17	With warnings	
	LC23 at 100.00%	0.17	With warnings	
	LC24 at 100.00%	0.17	With warnings	
	LC3 at 0.00%	0.18	With warnings	
	LC4 at 100.00%	**0.39**	**With warnings**	Eq. H2-1
	LC5 at 0.00%	0.28	With warnings	
	LC6 at 0.00%	0.25	With warnings	
	LC7 at 100.00%	0.14	With warnings	
	LC8 at 100.00%	0.37	With warnings	
	LC9 at 100.00%	0.26	With warnings	
36	LC1 at 0.00%	0.04	OK	
	LC10 at 100.00%	0.07	OK	
	LC11 at 100.00%	0.06	OK	

	LC12 at 0.00%	0.07	OK	Eq. H2-1
	LC13 at 0.00%	0.04	OK	
	LC14 at 0.00%	0.03	OK	
	LC15 at 0.00%	0.04	OK	
	LC16 at 100.00%	0.10	OK	
	LC17 at 0.00%	0.04	OK	
	LC18 at 100.00%	0.04	OK	
	LC19 at 100.00%	0.04	OK	
	LC2 at 0.00%	0.06	OK	
	LC20 at 0.00%	0.04	OK	
	LC21 at 100.00%	0.14	OK	
	LC22 at 100.00%	**0.14**	**OK**	Eq. H2-1
	LC23 at 100.00%	0.14	OK	
	LC24 at 100.00%	0.14	OK	
	LC3 at 100.00%	0.05	OK	
	LC4 at 0.00%	0.06	OK	
	LC5 at 100.00%	0.03	OK	
	LC6 at 0.00%	0.06	OK	Eq. H2-1
	LC7 at 0.00%	0.04	OK	
	LC8 at 100.00%	0.06	OK	
	LC9 at 0.00%	0.06	OK	
37	LC1 at 100.00%	0.06	OK	
	LC10 at 0.00%	0.07	OK	
	LC11 at 0.00%	0.07	OK	
	LC12 at 100.00%	0.06	OK	
	LC13 at 0.00%	0.04	OK	
	LC14 at 0.00%	0.03	OK	
	LC15 at 0.00%	0.04	OK	
	LC16 at 0.00%	0.10	OK	
	LC17 at 0.00%	0.04	OK	
	LC18 at 0.00%	0.04	OK	
	LC19 at 0.00%	0.04	OK	
	LC2 at 0.00%	0.06	OK	
	LC20 at 0.00%	0.04	OK	
	LC21 at 0.00%	0.14	OK	
	LC22 at 0.00%	0.14	OK	
	LC23 at 0.00%	**0.14**	**OK**	Eq. H2-1
	LC24 at 0.00%	0.14	OK	
	LC3 at 0.00%	0.06	OK	
	LC4 at 100.00%	0.07	OK	Eq. H2-1
	LC5 at 100.00%	0.05	OK	
	LC6 at 50.00%	0.06	OK	
	LC7 at 100.00%	0.06	OK	Eq. H2-1
	LC8 at 50.00%	0.07	OK	Eq. H2 1
	LC9 at 100.00%	0.07	OK	
38	LC1 at 100.00%	0.07	OK	
	LC10 at 100.00%	0.07	OK	
	LC11 at 0.00%	0.07	OK	
	LC12 at 0.00%	0.07	OK	Eq. H2-1
	LC13 at 100.00%	0.04	OK	
	LC14 at 100.00%	0.03	OK	
	LC15 at 0.00%	0.04	OK	
	LC16 at 100.00%	0.04	OK	
	LC17 at 0.00%	0.04	OK	
	LC18 at 0.00%	0.04	OK	
	LC19 at 0.00%	0.04	OK	
	LC2 at 100.00%	0.07	OK	Eq. H2-1
	LC20 at 0.00%	0.04	OK	
	LC21 at 100.00%	0.03	OK	
	LC22 at 100.00%	0.03	OK	
	LC23 at 0.00%	0.03	OK	
	LC24 at 0.00%	0.03	OK	

		LC3 at 50.00%	0.07	OK	
		LC4 at 0.00%	0.06	OK	
		LC5 at 100.00%	0.06	OK	
		LC6 at 100.00%	0.07	OK	
		LC7 at 50.00%	**0.08**	**OK**	Eq. H2-1
		LC8 at 46.88%	0.05	OK	
		LC9 at 100.00%	0.07	OK	
PIPE 2x0.154	**8**	LC1 at 33.33%	0.63	OK	
		LC10 at 33.33%	0.13	OK	
		LC11 at 33.33%	0.10	OK	
		LC12 at 33.33%	0.13	OK	
		LC13 at 31.25%	0.03	OK	
		LC14 at 31.25%	0.03	OK	
		LC15 at 31.25%	0.03	OK	
		LC16 at 31.25%	0.03	OK	
		LC17 at 31.25%	0.04	OK	
		LC18 at 33.33%	0.05	OK	
		LC19 at 33.33%	0.04	OK	
		LC2 at 33.33%	**0.90**	**OK**	Eq. H1-1b
		LC20 at 33.33%	0.05	OK	
		LC21 at 31.25%	0.04	OK	
		LC22 at 33.33%	0.05	OK	
		LC23 at 33.33%	0.04	OK	
		LC24 at 33.33%	0.05	OK	
		LC3 at 33.33%	0.63	OK	
		LC4 at 33.33%	0.90	OK	
		LC5 at 33.33%	0.63	OK	
		LC6 at 33.33%	0.90	OK	
		LC7 at 33.33%	0.63	OK	
		LC8 at 33.33%	0.90	OK	
		LC9 at 33.33%	0.10	OK	
	11	LC1 at 33.33%	0.08	OK	Eq. H1-1b
		LC10 at 31.25%	0.06	OK	
		LC11 at 31.25%	0.06	OK	
		LC12 at 31.25%	0.06	OK	
		LC13 at 31.25%	0.04	OK	
		LC14 at 31.25%	0.03	OK	
		LC15 at 31.25%	0.04	OK	
		LC16 at 31.25%	0.03	OK	
		LC17 at 31.25%	0.04	OK	
		LC18 at 31.25%	0.04	OK	
		LC19 at 31.25%	0.04	OK	
		LC2 at 33.33%	0.08	OK	
		LC20 at 31.25%	0.04	OK	
		LC21 at 31.25%	0.03	OK	
		LC22 at 31.25%	0.03	OK	
		LC23 at 31.25%	0.03	OK	
		LC24 at 31.25%	0.03	OK	
		LC3 at 31.25%	**0.10**	**OK**	Eq. H1-1b
		LC4 at 33.33%	0.08	OK	
		LC5 at 33.33%	0.08	OK	
		LC6 at 33.33%	0.08	OK	
		LC7 at 31.25%	0.10	OK	
		LC8 at 33.33%	0.08	OK	
		LC9 at 31.25%	0.06	OK	
	12	LC1 at 33.33%	0.34	OK	
		LC10 at 31.25%	0.11	OK	
		LC11 at 31.25%	0.06	OK	
		LC12 at 33.33%	0.07	OK	
		LC13 at 31.25%	0.04	OK	
		LC14 at 31.25%	0.03	OK	

	LC15 at 31.25%	0.04	OK	
	LC16 at 31.25%	0.04	OK	
	LC17 at 31.25%	0.04	OK	
	LC18 at 31.25%	0.06	OK	
	LC19 at 31.25%	0.04	OK	
	LC2 at 33.33%	**0.39**	**OK**	Eq. H1-1b
	LC20 at 33.33%	0.03	OK	
	LC21 at 31.25%	0.03	OK	
	LC22 at 31.25%	0.05	OK	
	LC23 at 31.25%	0.03	OK	
	LC24 at 33.33%	0.03	OK	
	LC3 at 33.33%	0.34	OK	
	LC4 at 33.33%	0.39	OK	
	LC5 at 33.33%	0.34	OK	
	LC6 at 33.33%	0.39	OK	
	LC7 at 33.33%	0.34	OK	
	LC8 at 33.33%	0.39	OK	
	LC9 at 31.25%	0.06	OK	
24	LC1 at 33.33%	0.34	OK	
	LC10 at 33.33%	0.07	OK	
	LC11 at 31.25%	0.10	OK	
	LC12 at 31.25%	0.09	OK	
	LC13 at 31.25%	0.04	OK	
	LC14 at 31.25%	0.03	OK	
	LC15 at 31.25%	0.04	OK	
	LC16 at 31.25%	0.05	OK	
	LC17 at 33.33%	0.02	OK	
	LC18 at 33.33%	0.03	OK	
	LC19 at 31.25%	0.05	OK	
	LC2 at 33.33%	**0.39**	**OK**	Eq. H1-1b
	LC20 at 31.25%	0.05	OK	
	LC21 at 31.25%	0.05	OK	
	LC22 at 31.25%	0.05	OK	
	LC23 at 31.25%	0.07	OK	
	LC24 at 31.25%	0.07	OK	
	LC3 at 33.33%	0.34	OK	
	LC4 at 33.33%	0.39	OK	
	LC5 at 33.33%	0.34	OK	
	LC6 at 33.33%	0.39	OK	
	LC7 at 33.33%	0.34	OK	
	LC8 at 33.33%	0.39	OK	
	LC9 at 33.33%	0.06	OK	
25	LC1 at 33.33%	0.63	OK	
	LC10 at 33.33%	0.13	OK	
	LC11 at 33.33%	0.10	OK	
	LC12 at 33.33%	0.13	OK	
	LC13 at 31.25%	0.03	OK	
	LC14 at 31.25%	0.03	OK	
	LC15 at 31.25%	0.03	OK	
	LC16 at 31.25%	0.05	OK	
	LC17 at 33.33%	0.04	OK	
	LC18 at 33.33%	0.05	OK	
	LC19 at 31.25%	0.04	OK	
	LC2 at 33.33%	**0.90**	**OK**	Eq. H1-1b
	LC20 at 33.33%	0.05	OK	
	LC21 at 31.25%	0.07	OK	
	LC22 at 31.25%	0.09	OK	
	LC23 at 31.25%	0.08	OK	
	LC24 at 31.25%	0.06	OK	
	LC3 at 33.33%	0.63	OK	
	LC4 at 33.33%	0.90	OK	
	LC5 at 33.33%	0.63	OK	

	LC6 at 33.33%	0.90	OK	
	LC7 at 33.33%	0.63	OK	
	LC8 at 33.33%	0.90	OK	
	LC9 at 33.33%	0.10	OK	
26	LC1 at 33.33%	0.08	OK	
	LC10 at 31.25%	0.06	OK	
	LC11 at 31.25%	0.06	OK	
	LC12 at 31.25%	0.06	OK	
	LC13 at 31.25%	0.04	OK	
	LC14 at 31.25%	0.03	OK	
	LC15 at 31.25%	0.04	OK	
	LC16 at 31.25%	0.08	OK	
	LC17 at 31.25%	0.04	OK	
	LC18 at 31.25%	0.04	OK	
	LC19 at 31.25%	0.04	OK	
	LC2 at 33.33%	0.08	OK	
	LC20 at 31.25%	0.04	OK	
	LC21 at 31.25%	0.14	OK	
	LC22 at 31.25%	0.14	OK	
	LC23 at 31.25%	0.14	OK	
	LC24 at 31.25%	**0.14**	**OK**	Eq. H1-1b
	LC3 at 33.33%	0.08	OK	
	LC4 at 31.25%	0.12	OK	Eq. H1-1b
	LC5 at 33.33%	0.08	OK	
	LC6 at 33.33%	0.08	OK	
	LC7 at 33.33%	0.08	OK	
	LC8 at 31.25%	0.11	OK	
	LC9 at 31.25%	0.06	OK	
29	LC1 at 31.25%	**0.29**	**OK**	Eq. H1-1b
	LC10 at 33.33%	0.04	OK	
	LC11 at 33.33%	0.06	OK	
	LC12 at 31.25%	0.08	OK	
	LC13 at 31.25%	0.04	OK	
	LC14 at 31.25%	0.03	OK	
	LC15 at 31.25%	0.03	OK	
	LC16 at 31.25%	0.08	OK	
	LC17 at 31.25%	0.04	OK	
	LC18 at 31.25%	0.03	OK	
	LC19 at 33.33%	0.02	OK	
	LC2 at 33.33%	0.22	OK	
	LC20 at 31.25%	0.03	OK	
	LC21 at 31.25%	0.14	OK	
	LC22 at 31.25%	0.12	OK	
	LC23 at 31.25%	0.11	OK	
	LC24 at 31.25%	0.13	OK	
	LC3 at 33.33%	0.28	OK	
	LC4 at 33.33%	0.22	OK	
	LC5 at 31.25%	0.29	OK	
	LC6 at 33.33%	0.22	OK	
	LC7 at 33.33%	0.28	OK	
	LC8 at 33.33%	0.22	OK	
	LC9 at 31.25%	0.11	OK	
30	LC1 at 33.33%	**0.74**	**OK**	Eq. H1-1b
	LC10 at 33.33%	0.06	OK	
	LC11 at 33.33%	0.11	OK	
	LC12 at 31.25%	0.07	OK	
	LC13 at 31.25%	0.03	OK	
	LC14 at 31.25%	0.03	OK	
	LC15 at 31.25%	0.03	OK	
	LC16 at 31.25%	0.05	OK	
	LC17 at 33.33%	0.06	OK	

	LC18 at 33.33%	0.04	OK	
	LC19 at 33.33%	0.06	OK	
	LC2 at 33.33%	0.36	OK	
	LC20 at 33.33%	0.04	OK	
	LC21 at 31.25%	0.11	OK	
	LC22 at 31.25%	0.12	OK	
	LC23 at 31.25%	0.13	OK	
	LC24 at 31.25%	0.13	OK	
	LC3 at 33.33%	0.74	OK	
	LC4 at 33.33%	0.36	OK	
	LC5 at 33.33%	0.74	OK	
	LC6 at 33.33%	0.36	OK	
	LC7 at 33.33%	0.74	OK	
	LC8 at 33.33%	0.36	OK	
	LC9 at 33.33%	0.11	OK	
31	LC1 at 31.25%	**0.11**	**OK**	Eq. H1-1b
	LC10 at 31.25%	0.06	OK	
	LC11 at 31.25%	0.06	OK	
	LC12 at 31.25%	0.06	OK	
	LC13 at 31.25%	0.04	OK	
	LC14 at 31.25%	0.03	OK	
	LC15 at 31.25%	0.03	OK	
	LC16 at 31.25%	0.05	OK	
	LC17 at 31.25%	0.02	OK	
	LC18 at 31.25%	0.02	OK	
	LC19 at 25.00%	0.02	OK	
	LC2 at 31.25%	0.07	OK	
	LC20 at 25.00%	0.02	OK	
	LC21 at 31.25%	0.05	OK	
	LC22 at 31.25%	0.05	OK	
	LC23 at 31.25%	0.05	OK	
	LC24 at 31.25%	0.05	OK	
	LC3 at 33.33%	0.06	OK	
	LC4 at 33.33%	0.06	OK	
	LC5 at 31.25%	0.10	OK	
	LC6 at 33.33%	0.06	OK	
	LC7 at 33.33%	0.06	OK	
	LC8 at 33.33%	0.06	OK	
	LC9 at 31.25%	0.06	OK	
48	LC1 at 100.00%	**0.30**	**OK**	Eq. H1-1b
	LC10 at 100.00%	0.05	OK	
	LC11 at 100.00%	0.05	OK	
	LC12 at 100.00%	0.05	OK	
	LC13 at 100.00%	0.01	OK	
	LC14 at 100.00%	0.01	OK	
	LC15 at 100.00%	0.01	OK	
	LC16 at 100.00%	0.01	OK	
	LC17 at 100.00%	0.02	OK	
	LC18 at 100.00%	0.02	OK	
	LC19 at 100.00%	0.02	OK	
	LC2 at 100.00%	0.29	OK	
	LC20 at 100.00%	0.02	OK	
	LC21 at 100.00%	0.02	OK	
	LC22 at 100.00%	0.02	OK	
	LC23 at 100.00%	0.02	OK	
	LC24 at 100.00%	0.02	OK	
	LC3 at 100.00%	0.30	OK	
	LC4 at 100.00%	0.29	OK	
	LC5 at 100.00%	0.29	OK	
	LC6 at 100.00%	0.29	OK	
	LC7 at 100.00%	0.29	OK	
	LC8 at 100.00%	0.29	OK	

	LC9 at 100.00%	0.05	OK	
49	LC1 at 100.00%	**0.30**	**OK**	Eq. H1-1b
	LC10 at 100.00%	0.05	OK	
	LC11 at 100.00%	0.05	OK	
	LC12 at 100.00%	0.05	OK	
	LC13 at 100.00%	0.01	OK	
	LC14 at 100.00%	0.01	OK	
	LC15 at 100.00%	0.01	OK	
	LC16 at 100.00%	0.01	OK	
	LC17 at 100.00%	0.02	OK	
	LC18 at 100.00%	0.02	OK	
	LC19 at 100.00%	0.02	OK	
	LC2 at 100.00%	0.29	OK	
	LC20 at 100.00%	0.02	OK	
	LC21 at 100.00%	0.02	OK	
	LC22 at 100.00%	0.02	OK	
	LC23 at 100.00%	0.02	OK	
	LC24 at 100.00%	0.02	OK	
	LC3 at 100.00%	0.30	OK	
	LC4 at 100.00%	0.29	OK	
	LC5 at 100.00%	0.29	OK	
	LC6 at 100.00%	0.29	OK	
	LC7 at 100.00%	0.29	OK	
	LC8 at 100.00%	0.29	OK	
	LC9 at 100.00%	0.05	OK	
50	LC1 at 100.00%	**0.30**	**OK**	Eq. H1-1b
	LC10 at 100.00%	0.05	OK	
	LC11 at 100.00%	0.05	OK	
	LC12 at 100.00%	0.05	OK	
	LC13 at 100.00%	0.01	OK	
	LC14 at 100.00%	0.01	OK	
	LC15 at 100.00%	0.01	OK	
	LC16 at 100.00%	0.01	OK	
	LC17 at 100.00%	0.02	OK	
	LC18 at 100.00%	0.02	OK	
	LC19 at 100.00%	0.02	OK	
	LC2 at 100.00%	0.29	OK	
	LC20 at 100.00%	0.02	OK	
	LC21 at 100.00%	0.02	OK	
	LC22 at 100.00%	0.02	OK	
	LC23 at 100.00%	0.02	OK	
	LC24 at 100.00%	0.02	OK	
	LC3 at 100.00%	0.30	OK	
	LC4 at 100.00%	0.29	OK	
	LC5 at 100.00%	0.30	OK	
	LC6 at 100.00%	0.29	OK	
	LC7 at 100.00%	0.30	OK	
	LC8 at 100.00%	0.29	OK	
	LC9 at 100.00%	0.05	OK	
51	LC1 at 51.56%	0.03	OK	
	LC10 at 50.00%	0.07	OK	
	LC11 at 50.00%	0.08	OK	
	LC12 at 50.00%	**0.08**	**OK**	Eq. H1-1b
	LC13 at 50.00%	0.04	OK	
	LC14 at 50.00%	0.03	OK	
	LC15 at 50.00%	0.04	OK	
	LC16 at 50.00%	0.06	OK	
	LC17 at 50.00%	0.04	OK	
	LC18 at 50.00%	0.04	OK	
	LC19 at 50.00%	0.05	OK	
	LC2 at 3.13%	0.05	OK	

		LC20 at 50.00%	0.05	OK	
		LC21 at 50.00%	0.07	OK	
		LC22 at 50.00%	0.07	OK	
		LC23 at 50.00%	0.08	OK	
		LC24 at 50.00%	0.08	OK	
		LC3 at 50.00%	0.08	OK	
		LC4 at 3.13%	0.07	OK	Eq. H3-1
		LC5 at 51.56%	0.03	OK	
		LC6 at 3.13%	0.05	OK	
		LC7 at 50.00%	0.07	OK	
		LC8 at 3.13%	0.07	OK	
		LC9 at 50.00%	0.07	OK	
	52	LC1 at 3.13%	0.07	OK	
		LC10 at 48.44%	0.07	OK	
		LC11 at 50.00%	0.06	OK	
		LC12 at 48.44%	0.07	OK	
		LC13 at 48.44%	0.04	OK	
		LC14 at 48.44%	0.03	OK	
		LC15 at 48.44%	0.03	OK	
		LC16 at 50.00%	0.06	OK	
		LC17 at 48.44%	0.02	OK	
		LC18 at 3.13%	0.02	OK	
		LC19 at 96.88%	0.02	OK	
		LC2 at 50.00%	0.04	OK	
		LC20 at 48.44%	0.02	OK	
		LC21 at 48.44%	**0.14**	**OK**	Eq. H1-1b
		LC22 at 48.44%	0.14	OK	
		LC23 at 48.44%	0.13	OK	
		LC24 at 48.44%	0.14	OK	
		LC3 at 50.00%	0.08	OK	
		LC4 at 48.44%	0.04	OK	
		LC5 at 3.13%	0.07	OK	
		LC6 at 50.00%	0.03	OK	
		LC7 at 50.00%	0.07	OK	
		LC8 at 48.44%	0.03	OK	
		LC9 at 48.44%	0.08	OK	
	53	LC1 at 50.00%	0.04	OK	
		LC10 at 50.00%	**0.09**	**OK**	Eq. H1-1b
		LC11 at 50.00%	0.08	OK	
		LC12 at 50.00%	0.07	OK	
		LC13 at 50.00%	0.04	OK	
		LC14 at 50.00%	0.03	OK	
		LC15 at 50.00%	0.04	OK	
		LC16 at 50.00%	0.04	OK	
		LC17 at 50.00%	0.04	OK	
		LC18 at 50.00%	0.05	OK	
		LC19 at 50.00%	0.05	OK	
		LC2 at 50.00%	0.07	OK	
		LC20 at 50.00%	0.04	OK	
		LC21 at 50.00%	0.04	OK	
		LC22 at 50.00%	0.04	OK	
		LC23 at 50.00%	0.04	OK	
		LC24 at 50.00%	0.04	OK	
		LC3 at 50.00%	0.06	OK	
		LC4 at 51.56%	0.06	OK	
		LC5 at 50.00%	0.04	OK	
		LC6 at 3.13%	0.07	OK	
		LC7 at 50.00%	0.04	OK	
		LC8 at 3.13%	0.05	OK	
		LC9 at 50.00%	0.07	OK	
T2L 3X3X1_4	**39**	LC1 at 0.00%	0.20	OK	

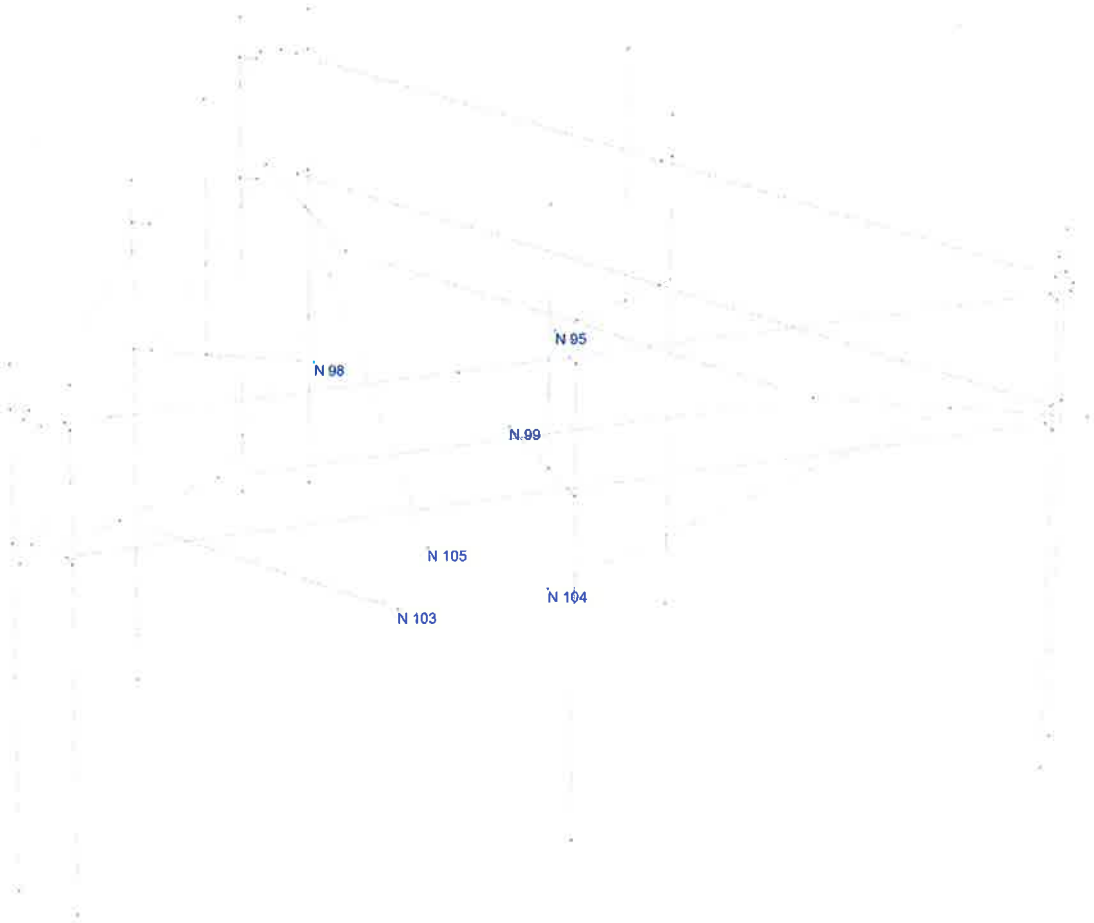
	LC10 at 0.00%	0.25	OK	
	LC11 at 0.00%	0.25	OK	
	LC12 at 0.00%	**0.25**	**OK**	Eq. H2-1
	LC13 at 0.00%	0.16	OK	
	LC14 at 0.00%	0.12	OK	
	LC15 at 0.00%	0.16	OK	
	LC16 at 0.00%	0.16	OK	
	LC17 at 0.00%	0.17	OK	
	LC18 at 0.00%	0.17	OK	
	LC19 at 0.00%	0.17	OK	
	LC2 at 0.00%	0.20	OK	
	LC20 at 0.00%	0.17	OK	
	LC21 at 0.00%	0.16	OK	
	LC22 at 0.00%	0.16	OK	
	LC23 at 0.00%	0.16	OK	
	LC24 at 0.00%	0.16	OK	
	LC3 at 0.00%	0.19	OK	
	LC4 at 0.00%	0.20	OK	
	LC5 at 0.00%	0.16	OK	
	LC6 at 0.00%	0.16	OK	
	LC7 at 0.00%	0.16	OK	
	LC8 at 0.00%	0.17	OK	
	LC9 at 0.00%	0.25	OK	
40	LC1 at 100.00%	0.21	OK	
	LC10 at 100.00%	0.25	OK	
	LC11 at 100.00%	0.25	OK	
	LC12 at 100.00%	0.25	OK	
	LC13 at 100.00%	0.16	OK	
	LC14 at 100.00%	0.12	OK	
	LC15 at 100.00%	0.16	OK	
	LC16 at 100.00%	0.25	OK	
	LC17 at 100.00%	0.17	OK	
	LC18 at 100.00%	0.17	OK	
	LC19 at 100.00%	0.17	OK	
	LC2 at 100.00%	0.18	OK	
	LC20 at 100.00%	0.17	OK	
	LC21 at 100.00%	0.41	OK	
	LC22 at 100.00%	0.41	OK	
	LC23 at 100.00%	**0.41**	**OK**	Eq. H2-1
	LC24 at 100.00%	0.41	OK	
	LC3 at 100.00%	0.20	OK	
	LC4 at 100.00%	0.18	OK	
	LC5 at 100.00%	0.17	OK	
	LC6 at 100.00%	0.14	OK	
	LC7 at 100.00%	0.16	OK	
	LC8 at 100.00%	0.14	OK	
	LC9 at 100.00%	0.25	OK	
41	LC1 at 100.00%	0.19	OK	
	LC10 at 100.00%	**0.25**	**OK**	Eq. H2-1
	LC11 at 100.00%	0.25	OK	
	LC12 at 100.00%	0.25	OK	
	LC13 at 100.00%	0.16	OK	
	LC14 at 100.00%	0.12	OK	
	LC15 at 100.00%	0.16	OK	
	LC16 at 100.00%	0.16	OK	
	LC17 at 100.00%	0.16	OK	
	LC18 at 100.00%	0.16	OK	
	LC19 at 100.00%	0.16	OK	
	LC2 at 100.00%	0.20	OK	
	LC20 at 100.00%	0.16	OK	
	LC21 at 100.00%	0.16	OK	
	LC22 at 100.00%	0.16	OK	

		LC23 at 100.00%	0.16	OK	
		LC24 at 100.00%	0.16	OK	
		LC3 at 100.00%	0.18	OK	
		LC4 at 100.00%	0.21	OK	
		LC5 at 100.00%	0.16	OK	
		LC6 at 100.00%	0.16	OK	
		LC7 at 100.00%	0.14	OK	
		LC8 at 100.00%	0.17	OK	
		LC9 at 100.00%	0.25	OK	
T2L 3X3X1_4X3_8	**45**	LC1 at 0.00%	0.10	OK	
		LC10 at 0.00%	0.17	OK	
		LC11 at 0.00%	**0.17**	**OK**	Eq. H2-1
		LC12 at 0.00%	0.16	OK	
		LC13 at 0.00%	0.10	OK	
		LC14 at 0.00%	0.08	OK	
		LC15 at 0.00%	0.10	OK	
		LC16 at 0.00%	0.10	OK	
		LC17 at 0.00%	0.10	OK	
		LC18 at 0.00%	0.10	OK	
		LC19 at 0.00%	0.10	OK	
		LC2 at 0.00%	0.11	OK	
		LC20 at 0.00%	0.10	OK	
		LC21 at 0.00%	0.09	OK	
		LC22 at 0.00%	0.09	OK	
		LC23 at 0.00%	0.09	OK	
		LC24 at 0.00%	0.09	OK	
		LC3 at 0.00%	0.11	OK	
		LC4 at 0.00%	0.10	OK	
		LC5 at 0.00%	0.07	OK	
		LC6 at 0.00%	0.08	OK	
		LC7 at 0.00%	0.08	OK	
		LC8 at 0.00%	0.07	OK	
		LC9 at 0.00%	0.16	OK	
	46	LC1 at 100.00%	0.11	OK	
		LC10 at 100.00%	0.17	OK	
		LC11 at 100.00%	0.16	OK	
		LC12 at 100.00%	0.16	OK	
		LC13 at 100.00%	0.10	OK	
		LC14 at 100.00%	0.08	OK	
		LC15 at 100.00%	0.10	OK	
		LC16 at 100.00%	0.10	OK	
		LC17 at 100.00%	0.10	OK	
		LC18 at 100.00%	0.10	OK	
		LC19 at 100.00%	0.10	OK	
		LC2 at 100.00%	0.11	OK	
		LC20 at 100.00%	0.10	OK	
		LC21 at 100.00%	0.09	OK	
		LC22 at 100.00%	0.09	OK	
		LC23 at 100.00%	0.09	OK	
		LC24 at 100.00%	0.09	OK	
		LC3 at 100.00%	0.09	OK	
		LC4 at 100.00%	0.10	OK	
		LC5 at 100.00%	0.08	OK	
		LC6 at 100.00%	0.08	OK	
		LC7 at 100.00%	0.07	OK	
		LC8 at 100.00%	0.07	OK	
		LC9 at 100.00%	**0.17**	**OK**	Eq. H2-1
	47	LC1 at 100.00%	0.10	OK	
		LC10 at 100.00%	0.16	OK	
		LC11 at 100.00%	0.16	OK	
		LC12 at 100.00%	0.17	OK	

LC13 at 100.00%	0.10	OK	
LC14 at 100.00%	0.08	OK	
LC15 at 100.00%	0.10	OK	
LC16 at 100.00%	0.22	OK	
LC17 at 100.00%	0.10	OK	
LC18 at 100.00%	0.10	OK	
LC19 at 100.00%	0.10	OK	
LC2 at 100.00%	0.10	OK	
LC20 at 100.00%	0.10	OK	
LC21 at 100.00%	0.29	OK	
LC22 at 100.00%	0.29	OK	
LC23 at 100.00%	0.29	OK	
LC24 at 100.00%	**0.29**	**OK**	Eq. H2-1
LC3 at 100.00%	0.10	OK	
LC4 at 100.00%	0.11	OK	
LC5 at 100.00%	0.07	OK	
LC6 at 100.00%	0.07	OK	
LC7 at 100.00%	0.08	OK	
LC8 at 100.00%	0.08	OK	
LC9 at 100.00%	0.16	OK	

APPENDIX D

ADDITIONAL CALCUATIONS

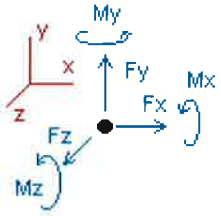

N 95
N 98
N 99
N 105
N 104
N 103
Y
X
Z

Bentley Hewlett-Packard Company

Current Date: 6/21/2018 10:06 AM
Units system: English
File name: W:\STRUCTURAL DEPARTMENT\ANALYSIS SOFTWARE\RAM Elements\RAM Projects\CROWN CASTLE\876377\876377.etz\

Analysis result

Reactions



Direction of positive forces and moments

Node	Forces [Kip] FX	FY	FZ	Moments [Kip*ft] MX	MY	MZ
Condition **LC1=1.2DL+1.6W0**						
95	0.48929	0.50500	1.50562	0.44758	-0.64578	0.62354
98	-0.45479	0.52686	1.44603	0.47117	0.58240	-0.65542
99	-0.06010	0.52948	0.92566	-0.94474	-0.04888	-0.00570
103	-0.98472	0.63215	0.63555	0.06206	0.07477	0.02339
104	1.00976	0.64443	0.65116	0.06753	-0.08023	-0.02683
105	0.00056	0.60497	-1.04638	0.00881	-0.00481	-0.00271
SUM	0.00000	3.44289	4.11765	0.11241	-0.12253	-0.04373
Condition **LC2=1.2DL+1.6W30**						
95	1.19424	0.52548	0.63312	0.46682	-0.66306	0.80621
98	1.20732	0.50704	-0.59264	0.33734	-0.64524	-0.59599
99	1.39259	0.53378	-0.01635	-0.83988	0.36682	-0.12001
103	-0.88287	0.59874	0.53353	0.00098	0.01035	-0.01015
104	1.05995	0.64566	0.58783	0.02661	0.01352	-0.06158
105	0.07941	0.63221	-1.14550	-0.03364	-0.12144	-0.06813
SUM	4.05064	3.44289	0.00000	-0.04177	-1.03905	-0.04965
Condition **LC3=1.2DL-1.6W0**						
95	-0.51445	0.54314	-1.48582	0.36733	0.65211	0.80159
98	0.48451	0.52129	-1.43415	0.35561	-0.57606	-0.76288
99	0.05552	0.51869	-0.95731	-0.69694	0.05521	-0.00114
103	-0.96242	0.61495	0.48919	-0.03251	-0.07416	0.02713
104	0.93789	0.60268	0.47272	-0.03859	0.08089	-0.02404
105	-0.00104	0.64214	-1.20227	-0.06733	0.00541	0.00304
SUM	0.00000	3.44289	-4.11765	-0.11244	0.14340	0.04371
Condition **LC4=1.2DL-1.6W30**						
95	-1.21940	0.52266	-0.61332	0.34809	0.66939	0.61892
98	-1.17760	0.54112	0.60452	0.48943	0.65158	-0.82232
99	-1.39717	0.51440	-0.01530	-0.80180	-0.36048	0.11317
103	-1.06427	0.64837	0.59121	0.02856	-0.00975	0.06067
104	0.88771	0.60145	0.53604	0.00234	-0.01286	0.01072
105	-0.07990	0.61490	-1.10315	-0.02488	0.12204	0.06846
SUM	-4.05064	3.44289	0.00000	0.04174	1.05992	0.04962

Condition **LC5=0.9DL+1.6W0**						
95	0.49243	0.37398	1.50315	0.34572	-0.64657	0.44540
98	-0.45851	0.39584	1.44454	0.36782	0.58161	-0.47814
99	-0.05952	0.39846	0.92962	-0.73953	-0.04967	-0.00485
103	-0.74133	0.47627	0.49496	0.05836	0.07469	0.01707
104	0.76631	0.48854	0.51067	0.06392	-0.08031	-0.02047
105	0.00062	0.44908	-0.76530	0.01613	-0.00488	-0.00275
SUM	0.00000	2.58217	4.11765	0.11242	-0.12514	-0.04373
Condition **LC6=0.9DL+1.6W30**						
95	1.19739	0.39446	0.63065	0.36496	-0.66385	0.62807
98	1.20360	0.37602	-0.59413	0.23399	-0.64604	-0.41870
99	1.39316	0.40275	-0.01239	-0.63467	0.36603	-0.11915
103	-0.63948	0.44285	0.39294	-0.00271	0.01028	-0.01647
104	0.81649	0.48977	0.44735	0.02299	0.01344	-0.05522
105	0.07947	0.47632	-0.86442	-0.02632	-0.12151	-0.06817
SUM	4.05064	2.58217	0.00000	-0.04176	-1.04166	-0.04965
Condition **LC7=0.9DL-1.6W0**						
95	-0.51130	0.41212	-1.48830	0.26546	0.65132	0.62345
98	0.48079	0.39027	-1.43564	0.25226	-0.57685	-0.58559
99	0.05609	0.38767	-0.95336	-0.49173	0.05442	-0.00028
103	-0.71903	0.45906	0.34860	-0.03620	-0.07424	0.02081
104	0.69443	0.44679	0.33223	-0.04220	0.08081	-0.01768
105	-0.00098	0.48625	-0.92119	-0.06002	0.00534	0.00300
SUM	0.00000	2.58217	-4.11765	-0.11244	0.14079	0.04371
Condition **LC8=0.9DL-1.6W30**						
95	-1.21626	0.39164	-0.61580	0.24623	0.66860	0.44078
98	-1.18132	0.41010	0.60303	0.38609	0.65079	-0.64503
99	-1.39660	0.38337	-0.01134	-0.59659	-0.36128	0.11402
103	-0.82088	0.49248	0.45062	0.02487	-0.00982	0.05435
104	0.64425	0.44556	0.39555	-0.00128	-0.01294	0.01707
105	-0.07984	0.45901	-0.82207	-0.01756	0.12196	0.06842
SUM	-4.05064	2.58217	0.00000	0.04175	1.05731	0.04963
Condition **LC9=1.2DL+Di+Wi0**						
95	0.03419	0.85842	0.18711	0.70535	-0.06437	1.21908
98	-0.03233	0.86272	0.18456	0.72168	0.08240	-1.21861
99	-0.00709	0.86261	0.08387	-1.46405	0.00555	-0.00820
103	-1.54634	0.99803	0.89443	0.02379	0.00460	0.03607
104	1.55206	1.00050	0.89634	0.02331	-0.00244	-0.03762
105	-0.00049	0.99250	-1.77331	-0.03832	0.00027	0.00014
SUM	0.00000	5.57478	0.47300	-0.02825	0.02601	-0.00914
Condition **LC10=1.2DL+Di+Wi30**						
95	0.11587	0.86113	0.07882	0.71845	-0.05678	1.25855
98	0.15256	0.85897	-0.04997	0.70042	-0.05245	-1.20121
99	0.18074	0.86402	-0.02334	-1.42697	0.07092	-0.02205
103	-1.53488	0.99215	0.88688	0.01956	0.00062	0.03321
104	1.55195	1.00011	0.89517	0.02169	0.00152	-0.03927
105	0.00076	0.99839	-1.78756	-0.04272	-0.00494	-0.00277
SUM	0.46700	5.57478	0.00000	-0.00957	-0.04110	0.02647

Condition **LC11=1.2DL+Di-Wi0**

95	-0.06945	0.86476	-0.15545	0.70442	0.07792	1.25195
98	0.07736	0.86050	-0.16986	0.71346	-0.06885	-1.23782
99	-0.00271	0.86063	-0.13018	-1.38086	0.00800	-0.00643
103	-1.54199	0.99528	0.88982	0.01872	-0.00326	0.03609
104	1.53734	0.99280	0.88606	0.01789	0.00387	-0.03530
105	-0.00055	1.00081	-1.79338	-0.04543	0.00107	0.00059
SUM	0.00000	5.57478	-0.47300	0.02821	0.01875	0.00909

Condition **LC12=1.2DL+Di-Wi30**

95	-0.15113	0.86205	-0.04717	0.69132	0.07033	1.21248
98	-0.10753	0.86424	0.06466	0.73471	0.06600	-1.25522
99	-0.19054	0.85921	-0.02296	-1.41794	-0.05738	0.00743
103	-1.55345	1.00116	0.89737	0.02294	0.00072	0.03895
104	1.53745	0.99320	0.88723	0.01951	-0.00009	-0.03366
105	-0.00180	0.99492	-1.77913	-0.04103	0.00628	0.00350
SUM	-0.46700	5.57478	0.00000	0.00953	0.08586	-0.02652

Condition **LC13=1.2DL**

95	-0.01258	0.52407	0.00990	0.40746	0.00317	0.71257
98	0.01486	0.52408	0.00594	0.41339	0.00317	-0.70915
99	-0.00229	0.52409	-0.01582	-0.82084	0.00317	-0.00342
103	-0.97357	0.62355	0.56237	0.01477	0.00030	0.02526
104	0.97383	0.62355	0.56194	0.01447	0.00033	-0.02543
105	-0.00024	0.62355	-1.12432	-0.02926	0.00030	0.00016
SUM	0.00000	3.44289	0.00000	-0.00001	0.01044	-0.00001

Condition **LC14=0.9DL**

95	-0.00943	0.39305	0.00743	0.30559	0.00238	0.53443
98	0.01114	0.39306	0.00445	0.31004	0.00238	-0.53186
99	-0.00172	0.39306	-0.01187	-0.61563	0.00238	-0.00256
103	-0.73018	0.46767	0.42178	0.01108	0.00023	0.01894
104	0.73037	0.46767	0.42145	0.01086	0.00025	-0.01907
105	-0.00018	0.46767	-0.84324	-0.02194	0.00023	0.00012
SUM	0.00000	2.58217	0.00000	-0.00001	0.00783	-0.00001

Condition **LC15=1.2DL+1.5LL1**

95	-0.01834	0.52280	0.00113	0.40697	0.00630	0.71028
98	0.02062	0.52281	-0.00283	0.41290	0.00003	-0.70686
99	-0.00229	0.87991	-0.01967	-1.47243	0.00317	-0.00342
103	-0.99096	0.63460	0.57265	0.01514	0.00072	0.02542
104	0.99121	0.63460	0.57221	0.01484	-0.00009	-0.02560
105	-0.00024	0.62319	-1.12348	-0.02913	0.00030	0.00016
SUM	0.00000	3.81789	0.00000	-0.65171	0.01044	-0.00001

Condition **LC16=1.2DL+1.5LL2**

95	-0.01306	0.52385	0.01019	0.40545	0.00316	0.70910
98	0.27303	0.50220	-0.45977	0.43043	-0.19513	-0.70688
99	0.53015	0.50219	-0.00658	-0.82736	0.20147	0.01249
103	-1.74508	1.06367	1.00779	0.05615	0.00025	0.09698
104	0.95449	0.61299	0.54995	0.01181	0.00392	-0.02485
105	0.00047	0.61299	-1.10158	-0.02742	-0.00329	-0.00185
SUM	0.00000	3.81789	0.00000	0.04906	0.01039	0.08498

Condition **LC17=1.2DL+WL0+1.5LLa1**

95	-0.00576	0.51978	0.05394	0.40648	-0.01667	0.70076
98	0.00738	0.52150	0.05140	0.41385	0.02377	-0.70008
99	-0.00370	1.23020	0.01823	-2.28184	0.00214	-0.00374
103	-1.01479	0.64966	0.58711	0.01660	0.00269	0.02575
104	1.01710	0.65064	0.58782	0.01642	-0.00186	-0.02636
105	-0.00022	0.62111	-1.11850	-0.02759	0.00010	0.00005
SUM	0.00000	4.19289	0.18000	-1.45608	0.01017	-0.00363

Condition **LC18=1.2DL+WL30+1.5LLa1**

95	0.02720	0.52077	0.01463	0.41186	-0.01674	0.71838
98	0.08032	0.52017	-0.03773	0.40540	-0.02984	-0.69101
99	0.06457	1.23081	-0.02449	-2.26370	0.02384	-0.00934
103	-1.01038	0.64734	0.58415	0.01492	0.00096	0.02477
104	1.01698	0.65046	0.58738	0.01590	-0.00057	-0.02692
105	0.00031	0.62334	-1.12393	-0.02928	-0.00212	-0.00119
SUM	0.17900	4.19289	0.00000	-1.44489	-0.02448	0.01470

Condition **LC19=1.2DL-WL0+1.5LLa1**

95	-0.04636	0.52234	-0.07514	0.40621	0.03768	0.71353
98	0.04930	0.52064	-0.08053	0.41070	-0.03210	-0.70738
99	-0.00087	1.22980	-0.06702	-2.24243	0.00419	-0.00308
103	-1.01282	0.64842	0.58519	0.01471	-0.00021	0.02572
104	1.01102	0.64744	0.58360	0.01429	0.00064	-0.02546
105	-0.00026	0.62424	-1.12611	-0.03032	0.00050	0.00028
SUM	0.00000	4.19289	-0.18000	-1.42685	0.01069	0.00361

Condition **LC20=1.2DL-WL30+1.5LLa1**

95	-0.07933	0.52136	-0.03583	0.40083	0.03774	0.69591
98	-0.02365	0.52197	0.00861	0.41915	0.02150	-0.71645
99	-0.06915	1.22919	-0.02430	-2.26058	-0.01750	0.00251
103	-1.01723	0.65075	0.58815	0.01639	0.00152	0.02670
104	1.01114	0.64762	0.58405	0.01481	-0.00065	-0.02491
105	-0.00079	0.62200	-1.12068	-0.02863	0.00273	0.00152
SUM	-0.17900	4.19289	0.00000	-1.43803	0.04535	-0.01472

Condition **LC21=1.2DL+WL0+1.5LLa2**

95	0.00620	0.52163	0.07384	0.40433	-0.01236	0.69892
98	0.48484	0.47040	-0.78280	0.43264	-0.31259	-0.66051
99	0.95301	0.53561	0.03243	-1.05575	0.37235	-0.00795
103	-2.39687	1.45091	1.38734	0.08229	0.00373	0.13845
104	0.95207	0.61147	0.54809	0.01122	0.00625	-0.02644
105	0.00075	0.60287	-1.07891	-0.02407	-0.00494	-0.00279
SUM	0.00000	4.19289	0.18000	-0.14933	0.05243	0.13969

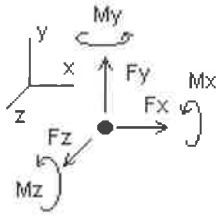
Condition **LC22=1.2DL+WL30+1.5LLa2**

95	0.03917	0.52262	0.03454	0.40972	-0.01243	0.71654
98	0.55778	0.46908	-0.87193	0.42418	-0.36619	-0.65144
99	1.02128	0.53622	-0.01029	-1.03760	0.39404	-0.01354
103	-2.39246	1.44859	1.38438	0.08061	0.00199	0.13748
104	0.95194	0.61128	0.54764	0.01071	0.00753	-0.02699
105	0.00128	0.60511	-1.08434	-0.02576	-0.00716	-0.00403
SUM	0.17900	4.19289	0.00000	-0.13814	0.01778	0.15802

Condition	**LC23=1.2DL-WL0+1.5LLa2**					
95	-0.03439	0.52419	-0.05523	0.40406	0.04199	0.71169
98	0.52676	0.46955	-0.91473	0.42948	-0.36846	-0.66780
99	0.95584	0.53521	-0.05281	-1.01633	0.37440	-0.00729
103	-2.39490	1.44968	1.38543	0.08040	0.00082	0.13843
104	0.94599	0.60826	0.54387	0.00909	0.00874	-0.02554
105	0.00071	0.60600	-1.08652	-0.02680	-0.00454	-0.00256
SUM	0.00000	4.19289	-0.18000	-0.12010	0.05295	0.14694
Condition	**LC24=1.2DL-WL30+1.5LLa2**					
95	-0.06736	0.52320	-0.01593	0.39868	0.04205	0.69407
98	0.45381	0.47087	-0.82560	0.43793	-0.31485	-0.67688
99	0.88756	0.53461	-0.01009	-1.03448	0.35270	-0.00170
103	-2.39932	1.45200	1.38838	0.08208	0.00256	0.13941
104	0.94611	0.60844	0.54432	0.00961	0.00746	-0.02498
105	0.00018	0.60377	-1.08109	-0.02511	-0.00231	-0.00132
SUM	-0.17900	4.19289	0.00000	-0.13128	0.08761	0.12860

Envelope for nodal reactions

Note.- **Ic** is the controlling load condition



Direction of positive forces and moments

Envelope of nodal reactions for :

LC1=1.2DL+1.6W0
LC2=1.2DL+1.6W30
LC3=1.2DL-1.6W0
LC4=1.2DL-1.6W30
LC5=0.9DL+1.6W0
LC6=0.9DL+1.6W30
LC7=0.9DL-1.6W0
LC8=0.9DL-1.6W30
LC9=1.2DL+Di+Wi0
LC10=1.2DL+Di+Wi30
LC11=1.2DL+Di-Wi0
LC12=1.2DL+Di-Wi30
LC13=1.2DL
LC14=0.9DL
LC15=1.2DL+1.5LL1
LC16=1.2DL+1.5LL2
LC17=1.2DL+WL0+1.5LLa1
LC18=1.2DL+WL30+1.5LLa1
LC19=1.2DL-WL0+1.5LLa1
LC20=1.2DL-WL30+1.5LLa1
LC21=1.2DL+WL0+1.5LLa2
LC22=1.2DL+WL30+1.5LLa2

LC23=1.2DL-WL0+1.5LLa2
LC24=1.2DL-WL30+1.5LLa2

Node		Forces						Moments					
		Fx [Kip]	lc	Fy [Kip]	lc	Fz [Kip]	lc	Mx [Kip*ft]	lc	My [Kip*ft]	lc	Mz [Kip*ft]	lc
95	Max	1.197	LC6	0.865	LC11	1.506	LC1	0.71845	LC10	0.66939	LC4	1.25855	LC10
	Min	-1.219	LC4	0.374	LC5	-1.488	LC7	0.24623	LC8	-0.66385	LC6	0.44078	LC8
98	Max	1.207	LC2	0.864	LC12	1.446	LC1	0.73471	LC12	0.65158	LC4	-0.41870	LC6
	Min	-1.181	LC8	0.376	LC6	-1.436	LC7	0.23399	LC6	-0.64604	LC6	-1.25522	LC12
99	Max	1.393	LC6	1.231	LC18	0.930	LC5	-0.49173	LC7	0.39404	LC22	0.11402	LC8
	Min	-1.397	LC4	0.383	LC8	-0.957	LC3	-2.28184	LC17	-0.36128	LC8	-0.12001	LC2
103	Max	-0.639	LC6	1.452	LC24	1.388	LC24	0.08229	LC21	0.07477	LC1	0.13941	LC24
	Min	-2.399	LC24	0.443	LC6	0.349	LC7	-0.03620	LC7	-0.07424	LC7	-0.01647	LC6
104	Max	1.552	LC9	1.001	LC9	0.896	LC9	0.06753	LC1	0.08089	LC3	0.01707	LC8
	Min	0.644	LC8	0.446	LC8	0.332	LC7	-0.04220	LC7	-0.08031	LC5	-0.06158	LC2
105	Max	0.079	LC6	1.001	LC11	-0.765	LC5	0.01613	LC5	0.12204	LC4	0.06846	LC4
	Min	-0.080	LC4	0.449	LC5	-1.793	LC11	-0.06733	LC3	-0.12151	LC6	-0.06817	LC6

Date: 6/21/2018
Project Name: Horton 2/ Fredsall Property
Project Number: 876377
Designed By: JN **Checked By:** MSC

HUDSON Design Group LLC

CHECK CONNECTION CAPACITY (Worse Case)

Reference: AISC Steel Construction Manual 9th Edition (ASD)

Bolt Type =	Threaded Rod
Bolt Diameter =	1/2 in.
Steel Grade =	A36

Allowable Tensile Load =

F_{Tall} = 3750 lbs.

Allowable Shear Load =

F_{Vall} = 1940 lbs.

WIND FORCES

Reaction **F =** 1388 lbs.

GRAVITY LOADS

Ice and Equipment 1452 lbs.

No. of Supports = 1
No. of Bolts / Support = 3

Tension Design Load /Bolts =

f_t = 462.67 lbs. < 3750 lbs. **Therefore, OK !**

Shear Design Load / Bolts=

f_v = 484.00 lbs. < 1940 lbs. **Therefore, OK !**

CHECK COMBINED TENSION AND SHEAR

f_t / F_T	+	f_v / F_V	≤	1.0			
0.123	+	0.249	=	0.373	<	1.0	**Therefore, OK !**